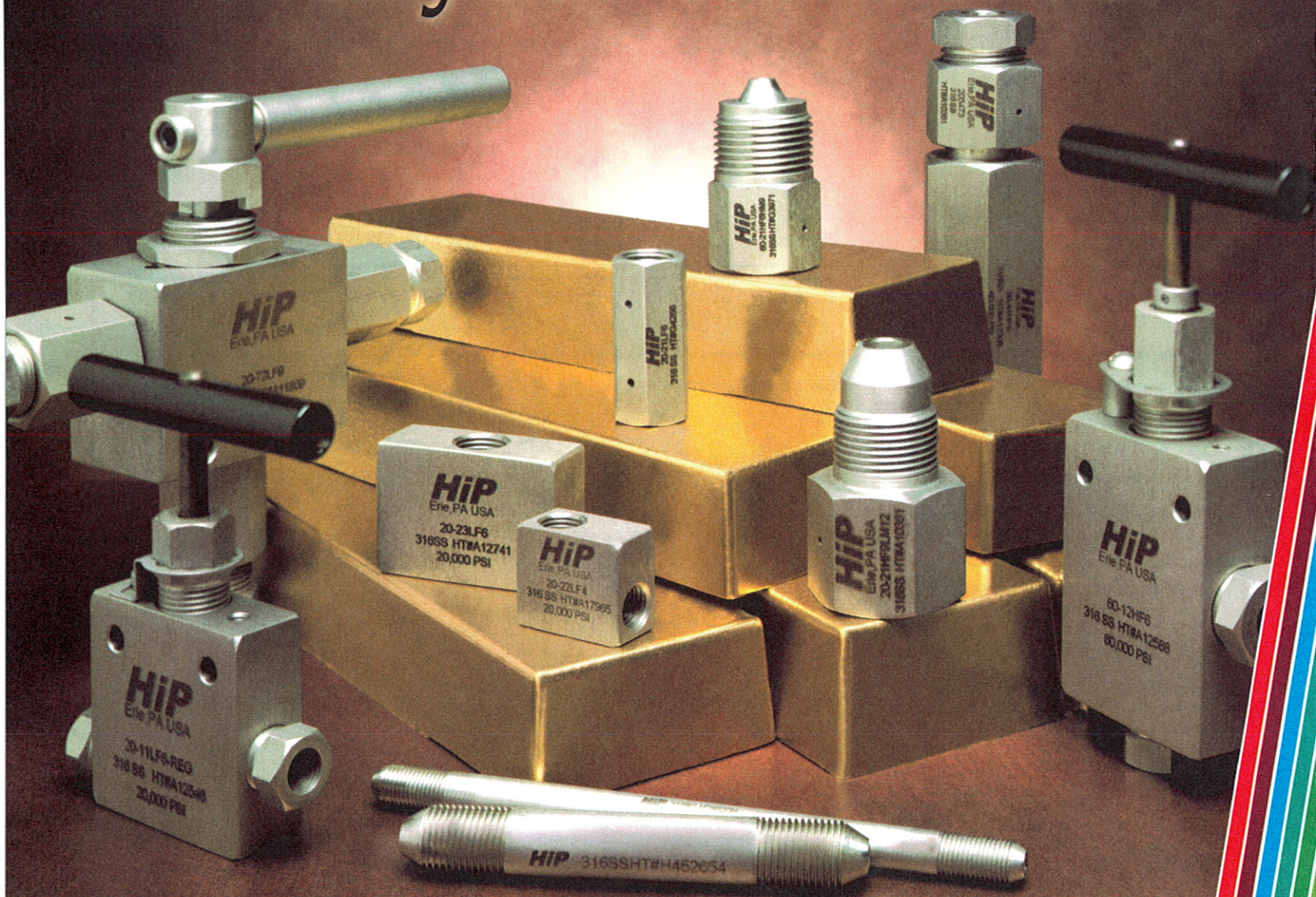


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## WJTA Jet News

WaterJet Technology  
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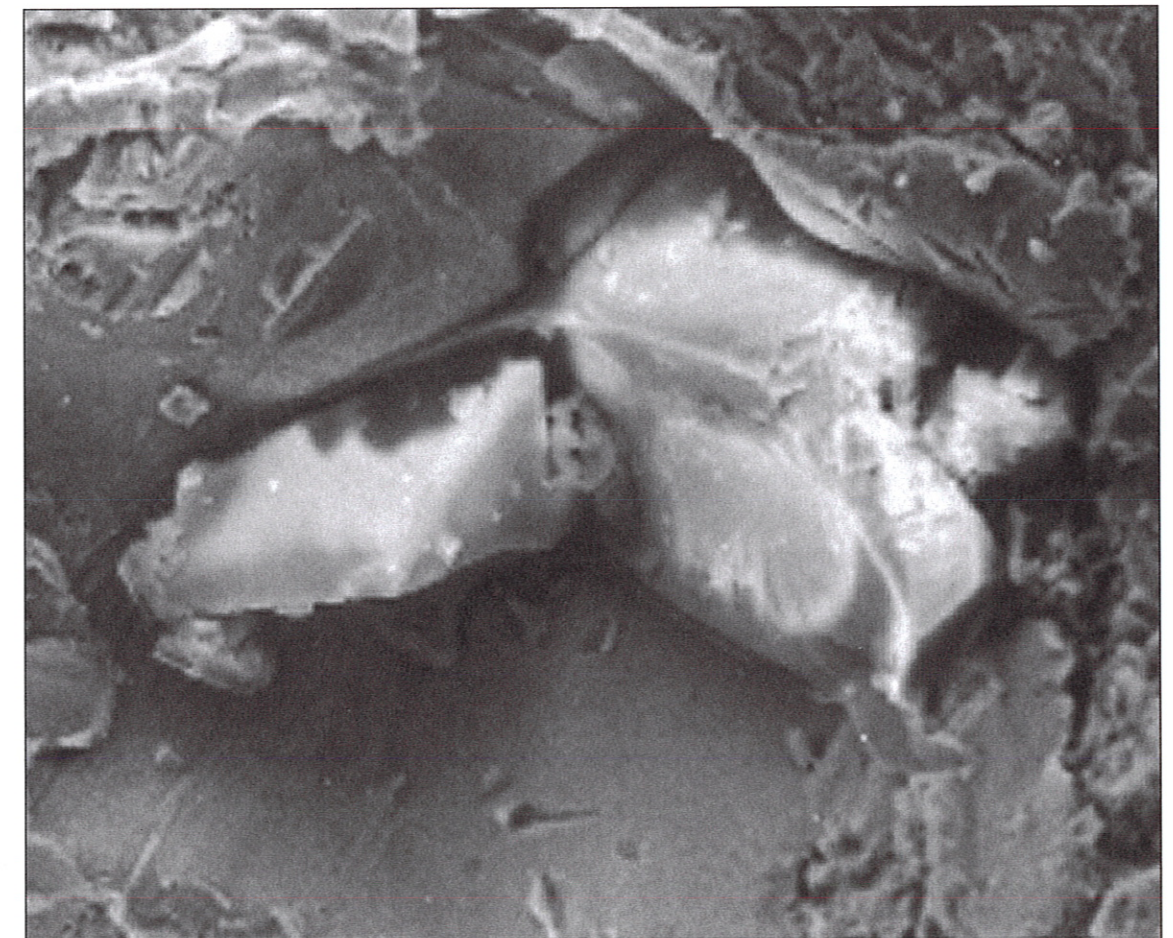


SEPTEMBER 2002

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for the benefit of its  
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### A Garnet Particle Implanted In A Metal Substrate By An Abrasive Waterjet



*Photograph courtesy of UMBC.edu.*

See page 4 for related article, "Hydroxyapatite Waterjet Peening Of Metal Orthopaedic Implants."

**50 µm**

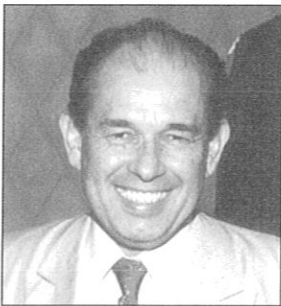
#### 2003 American Waterjet Conference

Conference Announcement ..... pg. 14  
Call for Papers ..... Insert



Plane Crash Claims The Life Of Luis Eugenio Ortega Trotter

We are saddened to report the untimely death of Luis Eugenio Ortega Trotter of Pinhais Parana, Brazil.



Luis Eugenio Ortega Trotter

Confirmed details were unavailable at press time, but we understand that on July 7, Luis was apparently piloting a plane that crashed into a hillside. He did not survive.

Luis was the director of Acquablast Tratamento de Superfícies Ltda in Pinhais Parana Brazil for 20 years.

Luis was a compassionate man. In February 1992 he contributed expertise, pumps and waterjet equipment toward a rescue effort after a five-story building collapsed in Guaratuba, Brazil. This building became a 12-meter-high pile of debris. The debris was compressed by a concrete water reservoir perched precariously on top of the pile. It was feared that this reservoir would slip off the pile and cause additional damage to live people trapped under the debris and to adjacent buildings.

The dimensions of the reservoir were 6 x 3 x 2 meters and the walls were 30 centimeters thick. The reservoir was made of reinforced concrete and was too heavy to be lifted by the available cranes. It was decided therefore to cut the reservoir into pieces and to remove it piecemeal. Luis' waterjets cut the concrete. The steel reinforced bars were cut with an oxyacetylene torch.

The removal of the tank took six hours and then Luis started cutting the

debris in the collapsed building. The debris was removed by hand by 200 volunteers. It was difficult because much of the concrete lay in difficult and dangerous positions. Care had to be taken to avoid vibration and dust and to shield the buried victims from the waterjets. After 24 hours of arduous work, Luis and his son Christian Trotter, working with police, firefighters and 200 volunteers, helped to rescue eight people.

Luis was a longtime member of WJTA. Many members are familiar with Luis through periodic contact regarding some waterjet topic or through conversations at the WJTA conferences, in which Luis always participated.

Luis was awarded in 2001 the WJTA Best Applications Paper for his work, "Comparison of Surface Preparation Using Different Methods." In this paper he presented compelling evidence for using waterjets for coatings removal.

On behalf of the WaterJet Technology Association officers, board of directors and staff, we extend our condolences and deepest sympathies to the family and friends of Luis Eugenio Ortega Trotter.

Upcoming Events

October 7-10, 2002

7th International Symposium on Environmental Issues and Waste Management in Energy and Mineral production, Hotel Setar, Cagliari, Sardinia, Italy. Mining and environmental issues, among other topics, will be addressed during the Conference program, which includes the presentation of selected papers in oral and poster sessions, three half-day technical trips, an exhibition and optional post-congress tours. For more information, contact the web sites

WJTA Bylaws

At the WJTA Board meeting held on August 23, 2002, the Board of Directors adopted an amendment to Article V – Board of Directors and Article VII – Nominations of Directors.

A brief synopsis of these changes appears below:

- The term of office will begin at the Board meeting held at the Biennial Waterjet Conference prior to the Biennial General Meeting (August 16, 2003).
- Nominations for elections to the Board must be received at least five months prior to the Biennial General Meeting (March 18, 2003).
- Three months prior to the Biennial General Meeting (May 18, 2003), ballots will be mailed to each eligible voting member.
- Ballots mailed to the Association office must be received no less than six (6) weeks (July 3, 2003) prior to the election to be counted.

A complete copy of the amended bylaws will be printed in the 2003 Directory. If you desire an amended copy of the bylaws please call the WJTA Office at (314) 241-1445.

www.swemp.com or http://geoing.unica.it/digita/swemp/index.htm or write Kassiopea Group Srl, Via S. Satta, 47 09128, Cagliari, Sardinia, Italy.

October 16-18, 2002

BHR Group 16<sup>th</sup> International Conference on Waterjetting: New Developments, Applications, Technologies, Centre de Congres, Aix-en-

(continued on page 20)

WaterJet Technology Association's Order Form for Publications/Products

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		WJTA Member Price	Non Member Price	Shipping & Handling	
_____ Proceedings Book & CD-ROM of The 2001 WJTA American Waterjet Conference (2001)	@	\$ 130.00	\$ 155.00	\$ 8.00	= \$ _____
_____ Proceedings Book & CD-ROM of The 10th American Waterjet Conference (1999)	@	\$ 65.00	\$ 80.00	\$ 8.00	= \$ _____
_____ Proceedings Of The 9th American Waterjet Conference (1997)	@	\$ 35.00	\$ 50.00	\$ 8.00	= \$ _____
_____ Proceedings Of The 8th American Waterjet Conference (1995)	@	\$ 25.00	\$ 35.00	\$ 8.00	= \$ _____
_____ An Overview of Waterjet Fundamentals And Applications, Fifth Edition (2001)	@	\$ 55.00	\$ 70.00	\$ 8.00	= \$ _____

A limited supply of the 7th Conference Proceedings are available for the cost of shipping (varies depending on destination). Contact WJTA for details.

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\*Contact the WJTA office for the shipping and handling charge of more than one Safety Video.

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Page 2

WJTA on the web: www.wjta.org

September 2002



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## Upcoming Events, from page 2

Provence, France. Technical papers and case studies are invited for presentation on all aspects of waterjetting in a variety of areas. Contact Emma Abson, Conference Organizer, BHR Group Limited, The Fluid Engineering Centre, Cranfield, Bedfordshire MK43 0AJ, UK, phone [44](0)1234-750422, fax: [44](0)1234 750074, e-mail: eabson@bhrgroup.com, web: www.bhrgroup.com

### November 3-7, 2002

SSPC 2002, the Industrial Protective Coatings Conference and Exhibit sponsored by The Society for Protective Coatings, Tampa Convention Center, Tampa, Florida. Visit [www.sspc.org](http://www.sspc.org), call 412-281-2331 or write 40 24<sup>th</sup> Street, 6<sup>th</sup> Floor, Pittsburgh, PA 15222-4656.

### November 13-16, 2002

Building China 2002, a trade exhibition and program of interest to professionals working with coatings and paint, ceramics and stone, flooring and more, China International Exposition Center, Beijing, China. For more information, contact Adsale People, Inc., 21070 Homestead

Road, Suite 100, Cupertino, California 95014, phone: (408)737-2820, fax: (408)737-2369, email: [info@us.adsale.com.hk](mailto:info@us.adsale.com.hk)

### 2003

#### March 20-23, 2003

China Stone+Biz, a program and exhibition for the stone industry and related tools and equipment, Xiamen International Conference and Exhibition Center. For more information, visit [www.stonebiz.net](http://www.stonebiz.net) or contact Xiamen Intop Exhibition Company, Suite 103, No. 141 Nanshan Road, Xiamen, Fujian, China (361009), phone: (86)592-2392333, fax: (86)592-2396880, email: [Intop@public.xm.fj.cn](mailto:Intop@public.xm.fj.cn)

#### March 24-27, 2003

Coverings 2003, a trade exposition for the ceramic tile, stone and floor coverings industry, Orange County Convention Center, Orlando, Florida. For more information, visit [www.coverings.com](http://www.coverings.com) or contact Coverings, 11940 U.S. Highway One, Suite 200, North

Palm Beach, Florida 33408, phone: (561)776-0600 or (800)881-9400, fax: (561)776-7466, email: [info@coverings.com](mailto:info@coverings.com)

### May 18-22, 2003

7<sup>th</sup> Pacific Rim International Conference on Water Jetting Technology, Seogwipo KAL Hotel, Jeju, Korea. Abstracts are now being accepted for the program. Contact Conference Chairman Prof. Chung-In Lee or Conference Secretary General Dr. Wan-Mo Kim, The Korean Society of Water Jet Technology, Research Institute of Energy & Resources, Seoul National University, San 56-1 Shilim-Dong, Gwanak-Gu, Seoul, 151-742, Korea, phone +82-2-880-7233, fax +82-2-873-2717, e-mail: [kswtj@kojet.org](mailto:kswtj@kojet.org), web site: [www.kojet.org](http://www.kojet.org)

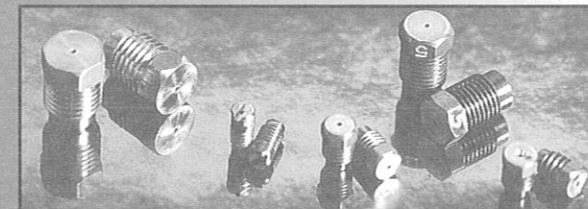
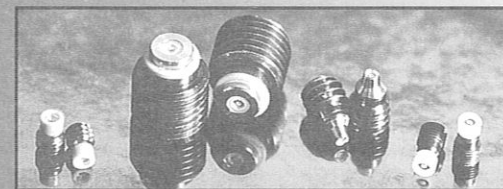
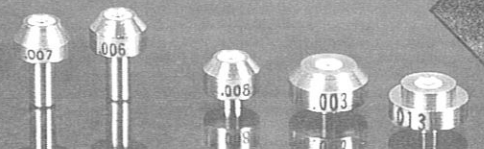
### August 16-19, 2003

WJTA American Waterjet Conference, Adam's Mark Hotel, Houston, Texas. **Celebrating the 20<sup>th</sup> Anniversary of the WaterJet Technology Association.** Visit [www.wjta.org](http://www.wjta.org), e-mail [wjta@wjta.org](mailto:wjta@wjta.org), call (314)241-1445 or fax (314)241-1449.

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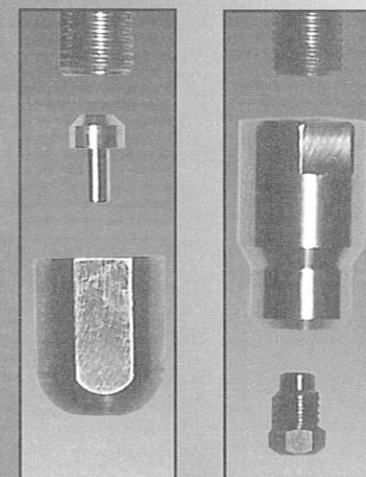
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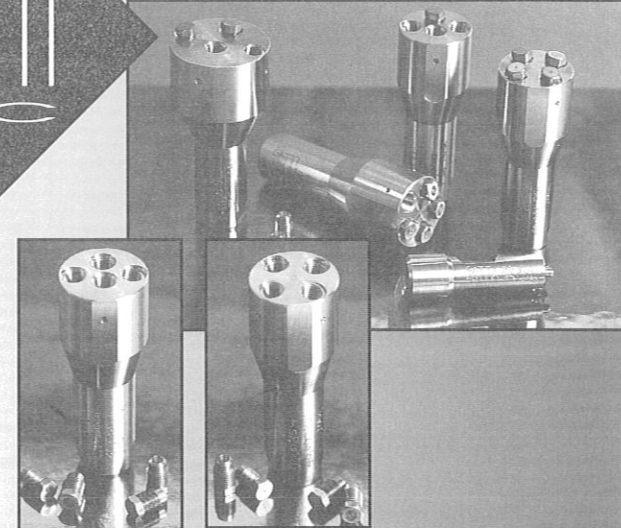
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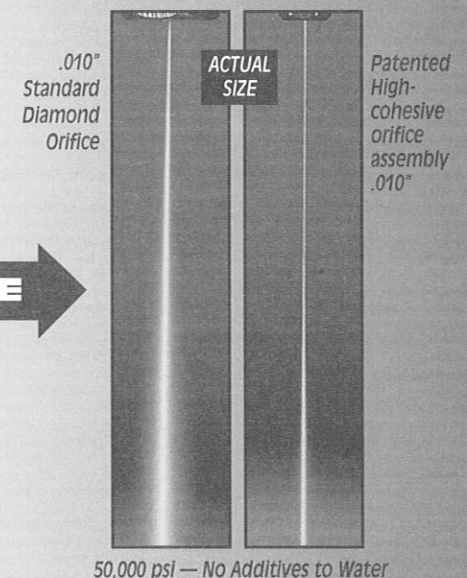
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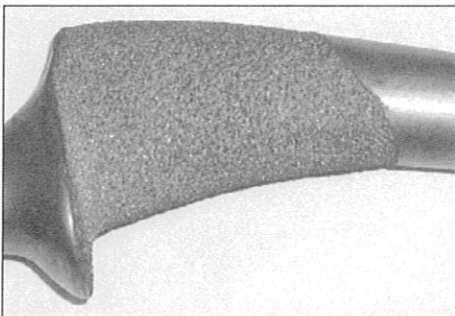


# Hydroxyapatite Waterjet Peening Of Metal Orthopaedic Implants

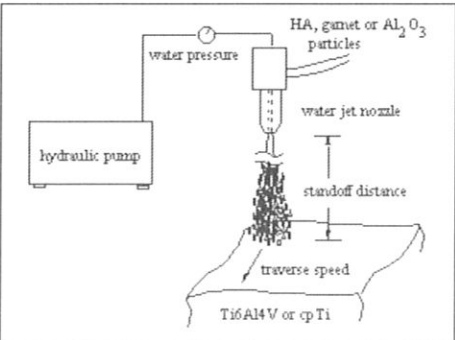
Total joint arthroplasty is a common surgical treatment for restoring mobility to those that suffer from chronic arthritis or disabling injury. In most circumstances the failing joint is replaced with a metal prosthesis of either titanium or cobalt chromium alloys. While joint replacements are becoming more commonplace, joint replacement failures are nearly as prevalent. Mechanical loosening of the implanted device results in extensive micromotion and/or secondary biological complications that often mandate revision joint replacement surgery. As fixation of the implanted device is a critical requirement for long-term arthroplasty success, the surface of implants and their ability to sustain fixation has been an important area of biomaterials research. Porous ceramic coatings are applied to the surface of implants to foster mechanical retention, especially in cementless arthroplasty. However, the deposition of porous coatings causes metallurgical transformations, introduces residual tensile stresses in the component's surface, and promotes surface stress concentrations. These factors can reduce the fatigue strength of metal implants to less than one third that of the wrought metal. In addition, delamination of the porous coating has been identified as a source of debris *in vivo*, which contributes to biological complications and third body wear of the articulating surfaces. The primary long-term goal of our research is to develop a surface treatment process that provides the critical requirements necessary for long-term success of metal orthopaedic implants without the addition of a coating (i.e. development of desired surface structure through material subtraction).

Hydroxyapatite Waterjet Peening (HAWP) is a new manufacturing

process that is envisioned for use in the surface treatment of metal implants. In relation to other more common methods of manufacturing, HAWP is a combination of abrasive waterjet machining and shot peening. The process consists of a high-pressure waterjet laden with bioactive particles (hydroxyapatite) that is directed at the substrate at a selected orientation of jet impingement. The jet serves as a medium for momentum transfer to the particles. A schematic diagram of HAWP highlighting the important process parameters is shown below.



A titanium femoral component with titanium plasma spray.



Schematic diagram of hydroxyapatite waterjet peening (HAWP) a titanium substrate.

Preliminary studies of the surface treatment have been conducted on titanium substrates (cpTi and Ti6Al4V) using garnet and aluminum oxide (Al<sub>2</sub>O<sub>3</sub>) particles. These other particles have been used as substitutes for hydroxyapatite and in these

applications the process is referred to simply as AWJ peening. The laboratory has focused preliminary investigations on the surface integrity of the AWJ peened surfaces and a comparison with that resulting from plasma spray treatments (the industry standard).

As expected, the surface texture resulting from AWJ peening of titanium has been found to be a function of the process parameters. Both the apparent surface stress concentration and the volume available for bone ingrowth in the AWJ peened surfaces were found to be primarily a function of the jet pressure and particle size. Residual stresses resulting from all treatment conditions were compressive and ranged from near 30 MPa to over 400 MPa. Previous studies have shown that plasma spray coatings result in the development of a biaxial tensile residual stress, which are detrimental to fatigue strength, and can reach values as high as 450 MPa. Thus, AWJ peening provides a surface integrity that is beneficial for the fatigue strength of metal implants and would support lifelong total joint replacement success. One further advantage is that the desired surface topography is obtained by material removal rather than through the addition of a coating. Loosening or delamination of the porous coating and the development of detrimental wear debris are not concerns with AWJ peened surfaces.

Garnet and Al<sub>2</sub>O<sub>3</sub> particles were found impregnated in the cpTi and Ti6Al4V surfaces after AWJ peening. Although the particle concentration was not estimated for all surfaces, it clearly increased with jet pressure and use of smaller particles. These results

(continued on page 9)

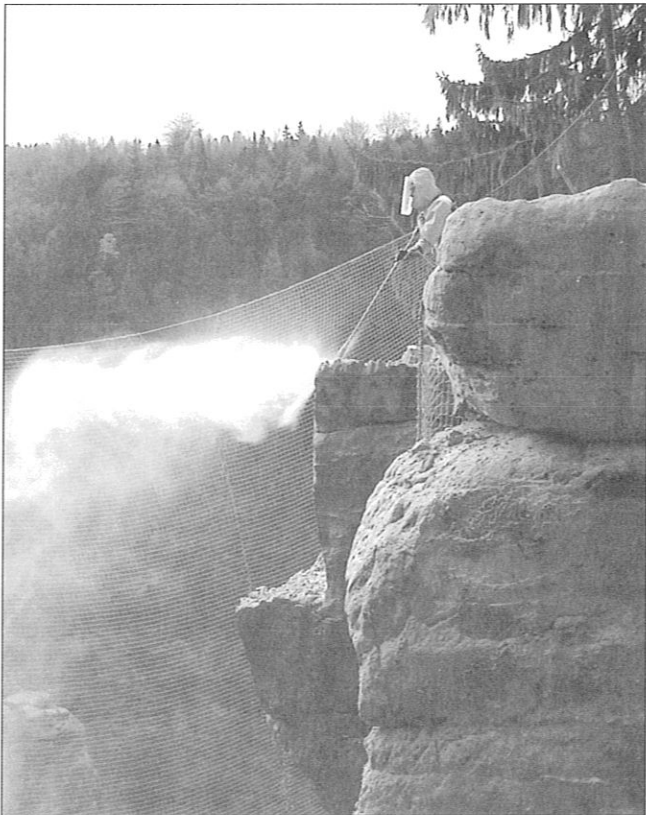
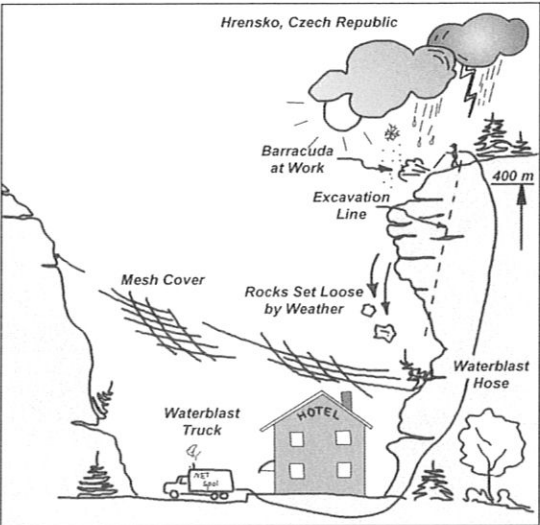
# Waterjets Stabilize A Slope In The Czech Republic

Ivan Wolf, at NET Spol S.r.o., sent us this story from the Czech Republic. Hrensko is a border town north of Prague in a resort area called Czech Switzerland. Both Czech and German National Parks are nearby, with hiking and bike trails and spectacular rock cliffs. Europe's largest natural rock bridge, Pravcicka Brana, is only 4 km from Hrensko.

The problem here is weather-related. The freeze-thaw cycle loosens rocks, which wash out in rainstorms, falling on the town below. Falling rocks threaten a local hotel in a beautiful location – right under the cliff. Since it's difficult to maintain a peaceful resort image with "Hardhat Required" signs, and equally as difficult to move the hotel, it was decided to remove unstable rock from the cliff.

The StoneAge Barracuda shotgun nozzle is used to cut, and break-off slabs of sandstone. Eight cubic meters of stone is removed each day, using a 1000 bar pump at 50 lpm. That's 282 cubic feet per day, using a 14,500 psi pump at 13.2 gpm. NET Spol has tackled a wide variety of waterblast jobs as diverse as highway re-surfacing and power plant cleaning using StoneAge tools.

Article and photographs reprinted from NEWSBLAST, June 2002, courtesy of StoneAge, Inc., Durango, Colorado.





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## Election of Board Members

The WaterJet Technology Association (WJTA) Board of Directors is an all-volunteer board. One-half of the twelve-member board is elected every two years for a four-year term.

Prior to each Biennial General Meeting, a call for nominations to the board is made by publishing an announcement in two successive issues of Jet News. The second such notice shall be no less than six months before the Biennial General Meeting. Any members of WJTA eligible to vote may nominate a member, including himself or herself, for election. Such nominations must be submitted in writing to the WJTA office at least five months prior to the Biennial General Meeting.

Three months before the Biennial General Meeting a list of eligible

nominees will be circulated with a written ballot by mail to all eligible voting members of WJTA. Signed ballots mailed to the WJTA office will then be tallied by WJTA management staff and names of the elected directors will be announced in Jet News and on the WJTA web site.

Those individuals receiving the highest number of votes will be elected as members of the Board of Directors of WJTA. Votes will not be counted if received less than six weeks before the Biennial General Meeting.

The Board of Directors elects all officers of the WJTA.

### WJTA Administration

#### Chairman of the Board

John Wolgamott  
(970)259-2869

#### President/Jet News Editor

George A. Savanick, Ph.D.  
(952)432-7594

#### Vice-President

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(512)392-2210

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Pat DeBusk  
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Mohamed Hashish, Ph.D.  
(253)850-3500

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Thomas J. Kim, Ph.D.  
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Thomas J. Labus  
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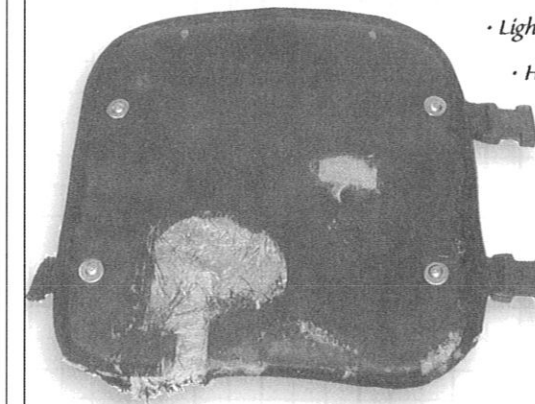
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## Waterjets Discussed At Coatings Workshop In Texas

On July 25, 2002, at the Solomon Ortiz Center, Port of Corpus Christi Texas, over 100 persons representing 63 companies and entities met for the third "Clean Water-Safe Harbor" workshop to discuss the future of surface preparation in terms of technology, economics, and environmental issues. The Small Business and Legal Governmental Assistance Division of the Texas Natural Conservation Commission (TNRCC) (soon to be named the Texas Commission on Environmental Quality (TCEQ) and the Advisory Council co-sponsored the workshop. Co-hosts to the meeting were Coastal Bend Bays and Estuaries Program, dedicated to protect and restore bays



**Corpus Christi Ship Channel**

and estuaries, and The Port Industries of Corpus Christi, an association of 13 of the area's largest port-related employers. The future lies in open, high-quality, communications between the regulatory agencies, inspectors, and the site owners and the contractors.

The windows of the conference room overlooked the Corpus Christi harbor in one direction, with massive ocean-going freighters at port. Another view faced the "Clean Texas" small craft Marina lined with restaurants, tourist attractions, sailboats, and pleasure craft. In another view, we saw the sails of a tall ship galleon. Rising majestically overhead was the arch of the high Corpus Christi Bridge.

Now it is time for the bridge to be repainted. During the day, Texas Department of Transportation

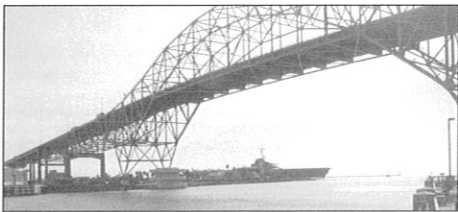


**Corpus Christi Marina**

engineers were seen conferring with contractors and talking amongst themselves as they sought solutions to corrosion.

The bridge, galleon, tankers, and pleasure craft represented the juxtaposition of the character of "Clean Water-Safe Harbor." The attendees had come together for a daring concept, to marry the needs and concerns of practical production personnel like contractors and sand-blasters, city and county inspectors, and owners with the requirements for the environmental permitting process in the state of Texas.

During the breaks, attendees talked among the exhibits or viewed the technology demonstrations. Like the conference, the exhibits were an eclectic mix, and included: Parker Hannifin-Polyflex with hoses and fittings; Holdtight with water inhibitors; Industrial Piping Specialists with pipe fittings; S & D Sales with Sponge-Jet; TurtleSkin Water Armour from Warwick Mills; Air and Waste



**Corpus Christi Bridge**

Engineering, a consulting firm; JRW Enterprises representing Wasser High-Tech Coatings; Eagle Industries with containment and filtering materials and NLB Corporation with high pressure pumps. Outside, many people saw for the first time, Flow International ultra-

high pressure feathering nozzles, Sponge-Jet cleaning, Carolina Equipment's Aqua-Miser water-abrasive systems, and TurtleSkin new personal protection equipment.

Some of the attendees were familiar with the pressure washing and water blasting industries, but some were not. The Clean Water-Safe Harbor conference is a marriage between different industries. The workshop is not just surface preparation, not just coatings, not just water blasting, and it is not just environmental. The workshop is very practical and



**TNRCC Exhibit**

oriented towards showing things that people haven't seen before.

Persons who can travel to meetings are familiar with some of the technology. However, for many attendees, this was their first chance to see it in-person, chat with the companies, and "kick the tires." The demonstrations were held alongside the channel. The professionalism of the demonstration companies put fears of runoff to rest. The companies are used to working in schoolyards, and setting demos in the heart of the cities. Above all Clean Water-Safe Harbor is an industrial environmental conference. The Port of Corpus Christi engineers were just as curious as everyone else.

Ken Zarker, TCEQ Division Manager of Pollution Prevention and Industry Assistance Section, opened the meeting with the objectives: 1) To support a pollution prevention workshop to improve environmental

(continued on page 7)

## Hydrodemolition On A Bridge In Sweden

One of Swedish contractor E-Schakt's Conjet hydrodemolition robots is assisting in the strengthening and reconstruction to the deck parapets of a single carriageway bridge, which carries the "Spånga Kyrkväg" road over a path and cycleway at Tensta, about 15km northwest of Stockholm. E-Schakt, working as the specialist hydrodemolition subcontractor for the bridge renovation main contractor DAB, has been successfully using its remotely operated, computer controlled Conjet Robot 362 to selectively remove the concrete parapet edge beams from each side of the deck, prior to replacing with new and more heavily reinforced parapets.

The approximate 39m long bridge is just one of numerous similar structures in Sweden, which need to be upgraded and strengthened to cope with the EU's 40 tonne weight limit. E-Schakt used its Conjet Robot 362 to remove an approximate 620mm wide by 400mm deep angled shaped reinforced concrete parapet on each side of the bridge. The Robot 362, operating with a Caterpillar diesel driven Hammelmann high pressure pump, supplying water at a pressure of 1000 bar and flow of 187 litres/min, had to cut out about 11m<sup>3</sup> of concrete on each of the two parapets. E-Schakt set the computer controlled Robot to use its twin level stepped cutting facility to remove the concrete from the parapets and expose the original reinforcement at the average rate of about 0.3 m<sup>3</sup>/high pressure hour.

"I am very pleased with the performance of the Conjet 362 Robot and the technical support we receive from Conjet," says E-Schakt contracts manager Dave Riches, who has over 17 years of experience performing hydrodemolition. "The machine does

an excellent job taking off only the damaged concrete above and below the reinforcement to leave a rough, clean, uneven textured surface to give a good bonding for the new concrete. Hydrodemolition with Conjet Robots doesn't cause any micro

cracks in the concrete left in place and leaves all the reinforcement intact and cleaned, unlike pneumatic breakers and milling machines, which can hit and vibrate the rebar and do a lot of extra damage by breaking the bond between the reinforcement and good concrete."

After E-Schakt removed the old parapet concrete, main contractor DAB, working for client Gatu-och Fastighetskontoret, followed on behind adding more reinforcement and casting in-situ new concrete parapet edge beams, prior to fixing stronger parapet safety barriers to complete the project.

"I believe Conjet hydrodemolition equipment is the best," adds E-Schakt founder and managing director Kjell Robsahm, who has considerable experience of hydrodemolition equipment. He worked in the late 1970s with Swedish contractor ABB (since renamed NCC), which, together with the Swedish National Road Authority, Vägverket and Sweden's major construction and mining equipment manufacturer Atlas Copco



**E-Schakt's Conjet Robot 362 removed the concrete from the bridge parapets leaving the reinforcement and services intact, ready for more rebar and new cast in-situ concrete edge beams. Photo courtesy of Conjet AB.**

jointly developed the Conjet hydrodemolition technique and Conjet equipment. In 1990 the senior managers of the Atlas Copco Conjet project formed Conjet AB following a management buyout. Kjell Robsahm left ABB and formed his own contracting company E-Schakt, which, based in Bromma, is now a major contractor working for Vägverket and Stockholm City.

For more information, visit [www.conjet.com](http://www.conjet.com), or contact Lars-Goran Nilsson, Conjet AB, PO Box 507, S-136 25 Haninge, Sweden, phone: 46-8-5565-2240, fax: 46-8-5565-2260, e-mail: [conjet@conjet.se](mailto:conjet@conjet.se) or Stephen Toms, National Hydro Inc., 5643 Warner Road, Fowlerville, MI 48836, phone: (517)223-0915, fax: (517)223-9525, e-mail: [toms@ismi.net](mailto:toms@ismi.net).

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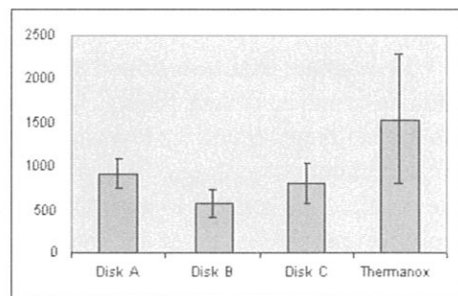
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## Hydroxyapatite Waterjet Peening, from page 9

peened and control cpTi disks. Thus, results from this in vitro study indicate that the cpTi surfaces impregnated with  $Al_2O_3$  appear to be non-toxic and are biocompatible to cells. They promoted the continued survival, proliferation and collagen expression of the osteoblast cell models. Preliminary results further suggest that a similar surface treatment conducted with an alternative ceramic formulation may enhance the growth and function of bone forming cells. We are currently evaluating the efficacy of surface treatments conducted with particles of different chemistry and hardness to establish a foundation of knowledge that can be used in development and optimization of our surface treatment process.

Authors of this paper are graduate students Mark L. McCain and Christopher Hall and Dwayne D. Arola, Ph.D., Director of the Laboratory for Advanced Manufacturing and Production (LAMP) and Assistant Professor of the Department of Mechanical Engineering, University of Maryland Baltimore County. Reprinted by permission from UMBC.edu.



Representative comparison of Thymidine uptake of osteoblast-like cells on the AWJ peened (A and B), titanium control, and plastic disks.

## Waterjets Discussed At Coatings Workshop In Texas, from page 6

compliance at abrasive blasting and coating operations, 2) to discuss environmental compliance issues, 3) to further the development of partnerships with the maintenance sectors, 4) provide alternate and new technologies that provide cleaner operations with waste minimization including technology demonstrations and discussion of economics.

Lydia Frenzel, Executive Director of the Advisory Council, spoke of the necessity of preparing for the future of your business. Change is the trend of the future. Preparing for change is preparing for the future. Frenzel urged each one to take what they heard and saw at the workshop and adapt it to their particular needs.

Chris Farschon, project manager from Corpro, traveled from New Jersey with the assistance of Robert Kogler, from the Federal Highway Research Administration. Farschon spoke on the complexities of removing hazardous material, lead-based paint, from very complex and hard-to-reach structures, i.e. bridges. He outlined economics, positives and negatives, and detailed an economic model with over 100 variables for eight processes ranging from open-air abrasive blasting, to waterjetting, chemical stripping, electrostripping, hand tool cleaning, and two methods of wet abrasive blasting.

The opening panel discussion ranged from all types of abrasives to wet abrasive blasting to a company who had just spent two years transitioning a dry-dock from dry blasting to waterjetting.

Ries Dejager, Technical Manager of BEI Pecal, Canada, handles all types of abrasives. Dejager featured specular hematite as it has been shown in a NIOSH study on toxicology to have excellent health ratings compared to other abrasives,

and in Dejager's opinion is an abrasive of the future.

Steve Cervantes, owner of S&D sales and stocking distributor of Sponge-Jet, Corpus Christi, spoke about blasting with a sponge material, the type of equipment needed, and advantages of low rebound and less fatigue. Blasting with sponges reduces 90% of the dust level.

Larry Fulmer, President of Carolina Equipment of North Charleston, works with pressure washers up to UHP WJ, with and without abrasives. The crowd woke up as Fulmer held up a cup of water and said we start by blasting with water alone, and you can drink this abrasive whenever you get tired. Fulmer held up a cup of baking soda, and said now this abrasive is also used with water. After you've had a hard night before, add a little of this abrasive to the water and you can drink the abrasive. Fulmer moved on to hard fine and coarse abrasive. Fulmer described several different methods of collection, recycling, reclamation, and disposal systems, both fixed and portable, that they have installed in military bases.

Jack Holmes, Vice President for Safety, Health, and Environmental Management at FirstWave Marine, described that FirstWave was having trouble getting air permits and their search for alternate, economical solutions. When they first looked at WJ, it was too expensive. Then two years ago, they brought in six different manufacturers. They purchased a unit to work on one dry dock. They brought a mobile unit that they can use anywhere on the yard. The positive benefits: They got the air permits without any trouble. They can blast any place in the yard without fear of drift over the property line. Accidents have literally disappeared. There is no dust in anyone's eyes. The men love it. The yard is clean.



Flow International Demo



Carolina Equipment Demo

Bob Murphy, Acting Deputy Director of Compliance Assurance and Enforcement Division, US EPA Region 6, spoke on the EPA's mission, "To protect human health and safeguard the natural environment – air, water, and land – upon which life depends," and the visions of the Environmental Protection Agency (EPA). "We need to seek more creative, more collaborative solutions. Solutions that go beyond the traditional role that EPA has played, and that develop partnerships with industry, with the states and local governments to address not just the effects, but the causes of pollution."

Ken Zarker, Manager of TCEQ Pollution Prevention and Industry Assistance, then spoke about the Environmental Management Systems and the partnerships potential between TCEQ and companies in Texas.

Ed Smith, President and CEO of Hartman-Walsh Painting Company, St. Louis, has blasted with probably every

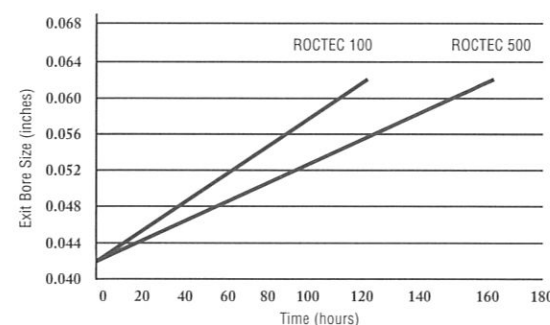
(continued on page 10)

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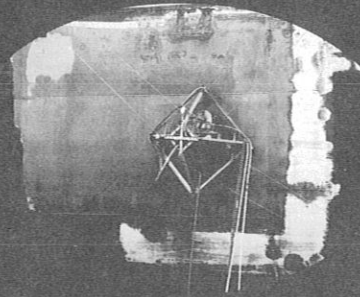
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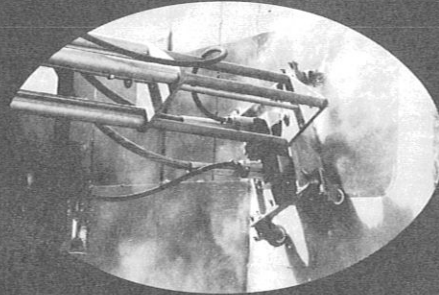
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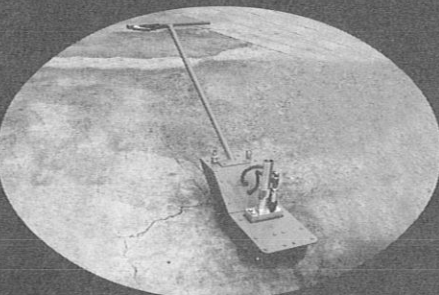
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## Waterjets Discussed At Coatings Workshop In Texas, from page 10

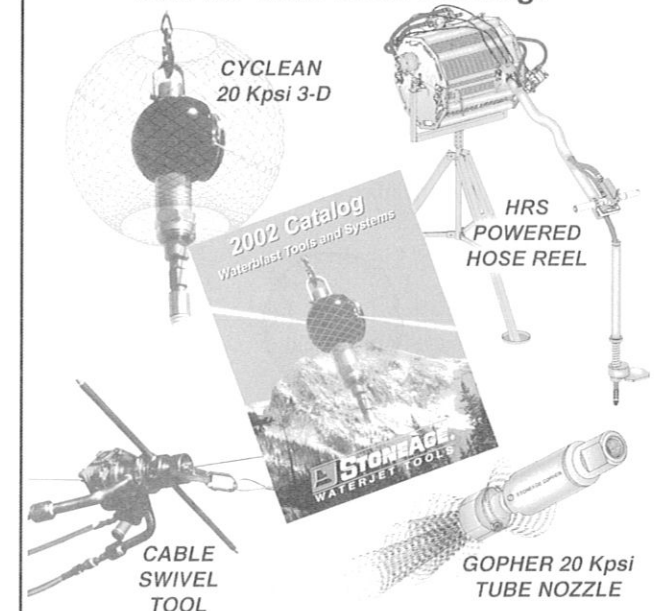
Will Wyman, SBLGA, talked about universal waste. This designation is very handy. Universal waste is waste that is generated by large numbers of people in large numbers of settings. It is waste that is difficult for the regulatory agencies to monitor. Examples are batteries, pesticides, paint and paint related waste, and hazardous waste lamps. Thus it is hazardous waste, but not labeled as hazardous waste nor counted towards hazardous waste generation. TCEQ is trying with universal waste to reduce the amount of hazardous waste that is going into the nonhazardous waste landfill and to encourage recycling and proper management of all hazardous waste.

Anne Marie Callery, program specialist and formerly an inspector, talked about storm water permitting where there is general runoff after rain hits the ground of a facility or construction site. Who needs a permit for storm water? Any industrial facility that falls under particular SIC codes and any construction site containing one acre or greater of disturbed land (December 2002) needs a permit. New in December 2002 is the requirement going from five acres to one acre. One option is to cover everything with tarps or roofs. Other options are to obtain an industry general storm water permit or an individual permit. The industry general permit is a simple one-page application to cover entities that are generally the same.

Jacqueline Boutwell, staff attorney, Environmental Law Division, Water Quality and Water Rights Division, talked on "Managing Waterjet Waste Water Discharges." Boutwell addressed the question of discharge of industrial waste into or adjacent to the water in the State. The rule covers all types of water: creeks, streams, lakes, and waterways. Boutwell also outlined that it is possible to make clean industrial water that can be used for beneficial reuse such as irrigation. Then the industrial waste is not a discharge.

This intensive workshop covered the choices in alternative technologies, a broad range of surface preparation from abrasive blasting to wet abrasive blasting to waterjetting. The TCEQ's detailed tips on what is coming up and where comments were being received on rules and fees, and web sites hit home with the audience. We went away feeling exhausted but very good. The small Business Assistance Division of TCEQ is serious about the phrase "We're from the government. We're here to help you." The attendees at "Clean Water-Safe Harbor" went away with new tools for the future of their businesses.

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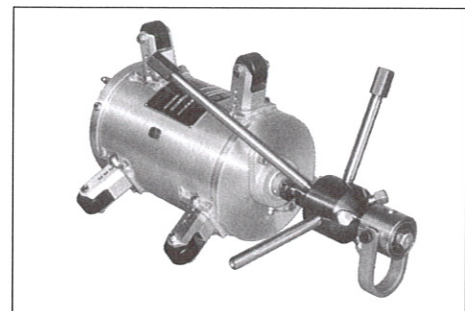
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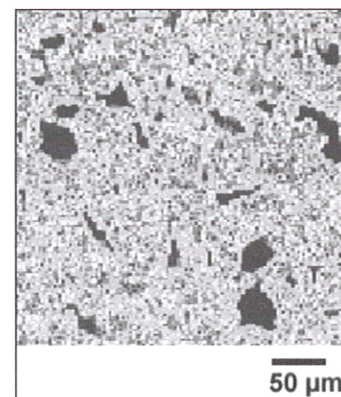
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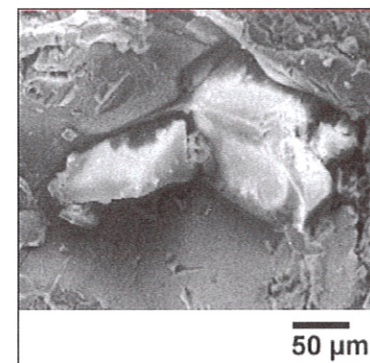
## Hydroxyapatite Waterjet Peening Of Metal Orthopaedic Implants, from page 4

suggest that osteoconductive particles (which stimulate bone growth) may be used in the surface treatment to provide a near surface implant chemistry, which further enhances mechanical interlock through aggressive bone ongrowth.

Hydroxyapatite particles impregnated in titanium are expected to be more appropriate for stimulating bone cell response based on their chemistry.



Al<sub>2</sub>O<sub>3</sub> particles impregnated in a cpTi substrate. The particles are black and the substrate is gray.



A single garnet particle impregnated in a Ti6Al4V substrate.

The proliferation and function of human tumor osteoblast-like cells (MG63) on cpTi disks subjected to AWJ peening were recently evaluated. Cell proliferation on two AWJ peened surfaces treated with Al<sub>2</sub>O<sub>3</sub> were evaluated, a control titanium surface (no AWJ peening) and a control plastic surface (Thermanox). The two AWJ peened disks (A and B) were differentiated by the surface roughness and concentration of impregnated Al<sub>2</sub>O<sub>3</sub>. Radiolabeled thymidine uptake by normal human osteoblast cells was used to indicate the proliferation of cells after a 4-day culture. A comparison of the cells propagated on the AWJ peened disks and controls (cpTi, C and plastic, D) indicated that cells adapted and proliferated more vigorously on the plastic control disk (D) than on the cpTi as evident from the proliferative indices (below). Thymidine uptake among the AWJ peened and control cpTi disks were similar. Differences in surface roughness between the three cpTi surfaces appears to have affected the cell response. Nevertheless, there were no significant differences in proliferative capacity of cells cultured on the AWJ

(continued on page 16)

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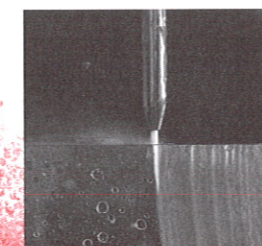
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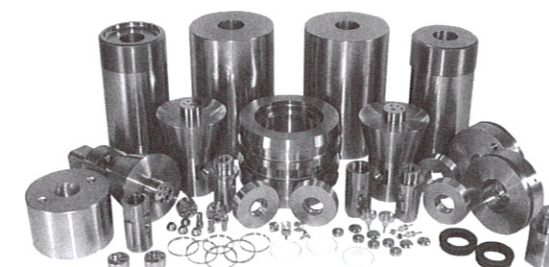
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## Waterjets Discussed At Coatings Workshop In Texas, from page 7

abrasive on the market and has worked on large to small projects of all types. The McAlpine Lock and Dam was new construction gate



Demo Crowd Examining Steel Plate

replacement done with coal slag to remove mill scale and create a profile. The Sewells Point fuel facility was located on a Naval base very close to the mooring piers and operations with several tanks of different configurations with paint removal. Smith outlined, "How do you choose the right process?" The first consideration is safety. The second priority is environmental. The third priority is economics and production.

Contractors live and die by economics, but first priority is safety. It's got to make sense.

Smith emphasized if you have a heavy thick coating, you can take UHP WJ, cut through the coatings, and it literally flies off. Secondly they go into areas where there are salts around. When they get the salts off, the coatings last. In many cases water is economical because there are areas where you absolutely do not want any salt or dust.

Richard Dupuy, president of UHP Projects from Newport News, uses ultra-high pressure waterjetting systems. Dupuy covered offshore, marine, pipeline and petrochemical plants. Removal of paint by WJ has found a niche in every type of industrial project that people can think of. As any process, it has preferred niches. Waterjetting is very good on the thick coatings that build up; areas

around equipment that has to keep working; and situations where the operations cannot be out of service when they are doing waterjetting. Dupuy talked about the USS Wisconsin where they removed and repainted all the freeboard down to the water line pier side so the vessel didn't have to go into dry-dock.

Dupuy said if there is an area where you can open blast a tank without concern about surrounding areas or containment than it makes more sense to use abrasive. If there is lead, if there is any reason to contain the project and any reason why you cannot have abrasives around, water is very competitive.

Gerald Hargrave of NLB Corporation went through practical applications and diversity of ultra-high-pressure waterjetting with vacuum attachment.

Then came the "Dream Team." Glenda Swierc, TCEQ Region 14 Small Business Assistance Program (SBLGA) specialist, brought together TCEQ program specialists to speak on air, waste, water, and storm water. The overall message was "We are here to help you. We will guide you through one-line permits which cost you nothing to individual specific permits that are time consuming and more expensive."

Glenda Swierc emphasized: Small business assistance is confidential, completely separate from enforcement. It's at no risk and it's free to the small businesses that might be regulated by TCEQ. In 2001 they assisted 5000 entities. They averted 69 enforcement cases which saved the small businesses approximately \$262,000 in fines. They maintain a toll-free number answered by a person, not a recording. They have field staff all over the state of Texas. Companies can request a free and confidential site visit where a professional environmen-

tal consultant comes on your site and identifies compliance issues and offers solutions. Two hundred-thirty site visits were conducted in 2001. If the entity corrects all the compliance deficiencies, they are eligible for "Compliance Commitment Partnership," and get a Certificate of Recognition from TCEQ and can get a one-year exemption from routine field inspections.

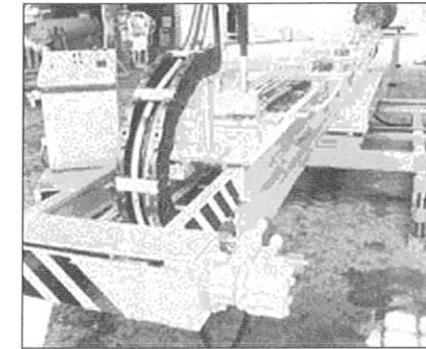
Louise Ngo, from air permits chemical division, outlined Permit by Rule (PBR), exemptions from air permits, and individual permits. Anybody who is going to emit any type of air contaminants and any amount of air contaminants, whether construction of new facilities or modifying existing facilities, needs to talk with their local SBLGA representative. PBR are "one-liners" and quick to apply for and get an answer. Individual permits take longer and are site specific.

Glenda Swierc spoke about PBR. For PBR, you must meet the criteria exactly. Swierc specifically talked about a new PBR involving repairs and maintenance not involving structural changes where no new or permanent facilities are installed. The "catch all" rule for air permits: No person shall discharge from any source whatsoever one or more air contaminants or combinations thereof in such concentration and of such duration as or may tend to be injurious to or adversely affect human health or welfare, animal life, vegetation, or property or as to interfere with the normal use and enjoyment of animal life, vegetation, or property.

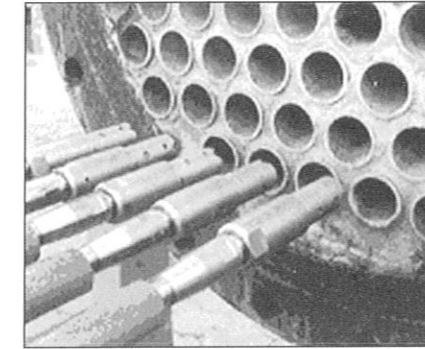
TCEQ has industry checklists for companies like printers, surface coating, and auto body shops. A new Surface Coaters Guide is coming this fall. A draft of this guide can be downloaded from [www.advisorycouncil.org](http://www.advisorycouncil.org).

(continued on page 15)

## New Equipment, from page 12



Overall view, drive and control panel.



High-pressure lances.

### Technical Data:

Operating pressure:	up to 1000 bar, (14,500 psi)
Working range:	bundle diameters between 40mm and 2000mm, (1.5 in. – 78 in.) tube lengths up to 6000mm (19.6 ft.)
Transport weight:	4600 kg (10,140 lbs.)
Power supply:	380 Volt, 15 kW for the hydraulic unit

For information, visit [www.womacorp.us](http://www.womacorp.us) or contact Woma Corporation, P.O. Box 6793, Edison, NJ 08818, phone: 800-258-5530, fax: 732-417-0015, e-mail: [womacorp@bellatlantic.net](mailto:womacorp@bellatlantic.net).

(New Equipment continued on page 14)

## Safety:

### Cleaning Heat Exchangers

Safety lessons can be learned from incidents in which unexpected hazards are produced even though no one is injured.

Recently, while the shell side of a horizontal heat exchanger with one-inch-diameter tubes was being cleaned with a waterjet, a steel plug in one end of one of the tubes was expelled with great force. This was unexpected and might have caused a serious injury if the plug had hit anyone.

This hazardous situation was unexpected because the shell side of the heat exchanger was being cleaned and the plug was expelled even though no cleaning lance was introduced inside the one-inch tube. The tapered steel plug, normally tightly hammered

into place, evidently was loose. Steel plugs are placed in those tubes that are not in service.

The question of how the tube because pressurized enough to expel the steel plug is not understood. Perhaps there was a leak in the tube or perhaps the cooling effect of the jetting water condensed enough steam to fill and pressurize the tube.

In any case, workers cleaning the shell side of heat exchangers should be aware of the presence of these plugs and the fact that these plugs can become unexpected hazardous projectiles.

In another recent incident involving tube bundles, a quarter-inch-thick

## Safety Committee Solicits Comments On Improvements To Recommended Practices

The WJTA Safety Committee solicits comments regarding improvements to the publication, *Recommended Practices for the Use of Manually Operated High Pressure Waterjetting Equipment*. While the 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, 917 Locust Street, Suite 1100, St. Louis, MO 63101-1419, fax: (314)241-1449, e-mail: [wjta@wjta.org](mailto:wjta@wjta.org), web site: [www.wjta.org](http://www.wjta.org).

piece of plywood was placed beyond the downstream end of a tube bundle while the inside of the tubes was being cleaned with a waterjet lance. A plug of product was dislodged from the inside of a tube and was expelled from the downstream end of the tube during lancing. This plug was propelled completely through the plywood barrier and thus created a hazard being the barrier.

This underscores the necessity of maintaining a safety zone around the job site even though a downstream barrier is used. It also shows that a metal barrier would be preferable to plywood for guarding the downstream end of the tube bundle during lancing.