INSIDE

• JAM Preview
• Wastewater Math
• From Military to Utility

Our Vision: The Virginia Water Environment Association (VWEA) will preserve and enhance Virginia’s Water Environment, now and for future generations.
What we see in the latest climate change science is not only a prediction that the intensity of events will increase, but also the frequency of events.

- Ben Stanford, Director of Applied Research at Hazen and Sawyer
What we see in the latest climate change science is not only a prediction that the intensity of events will increase, but also the frequency of events.

Ben Stanford, Director of Applied Research at Hazen and Sawyer
A quality prepackaged pump station solution pre-engineered for your needs.

The OneLift Pump Station by Oldcastle Precast provides a standard turnkey pump station product with the distinction of a sole-source point of responsibility. The OneLift Pump Station is designed with an integral valve vault built into the unused top portion of the wet well, which yields a single-structure product that solves the problems of differential settlement, found with the conventional 2-structure systems. In addition, the single-structure design significantly reduces the product footprint, cost, complexity, size of excavation, and time required for installation.
JAM Preview
Plan now to attend WaterJAM in Hampton, September 8-11, 2014.

Using Pole Camera Technology
The Prince William County Service Authority has found a quicker, more convenient way of monitoring sewer infrastructure located near water.

Wastewater Math: The Case of the Missing Influent
Here is a real-life example that demonstrates how using math can solve not only exam or training problems, but real-world, major operational issues as well.

From Military to Utility
A primer for human resources to hire experienced military veterans.

Mowing Safety
Lawn mowers and yard tractors are the primary workhorses of most grounds care operations. They also present a high potential for severe injury or even death to those who work with and around them.

Relative Performance of Grit Removal Systems
Biological processes continue to evolve toward better effluent quality in a smaller footprint. The fact that these processes are housed in a small footprint means that they have an inherent inability to store grit and debris. This, in conjunction with the trend towards reductions in plant personnel, drives the need for advanced headworks processes that are more effective at removing grit and debris.

FEATURES

JAM Preview
Plan now to attend WaterJAM in Hampton, September 8-11, 2014.

Using Pole Camera Technology
The Prince William County Service Authority has found a quicker, more convenient way of monitoring sewer infrastructure located near water.

Wastewater Math: The Case of the Missing Influent
Here is a real-life example that demonstrates how using math can solve not only exam or training problems, but real-world, major operational issues as well.

From Military to Utility
A primer for human resources to hire experienced military veterans.

Mowing Safety
Lawn mowers and yard tractors are the primary workhorses of most grounds care operations. They also present a high potential for severe injury or even death to those who work with and around them.

DEPARTMENTS & ASSOCIATION NEWS

President’s Corner 8
From Your Administrator 13
Scholarships 15
Sustainable Utilities Tour 25
Herb Evans Memorial Golf Tournament 29
Wastewater Ops Conference 38
Industrial Waste and Pretreatment Committee 40
Lab Practices Committee 57
CVRAC 59
Collection Systems Committee 60

All rights reserved. The contents of this publication may not be reproduced in whole or in part without the express consent of the publisher.
EBARA STANDARD PUMPS

Engineered for Performance
BUILT TO LAST.

Represented by:

Winschel Environmental LLC
Pump and Process Equipment
Richmond (804) 545-5115
Roanoke (540) 632-0111
www.winenv.com

EBARA Fluid Handling
an EBARA International Corporation company
pumpsebara.com    (803) 327-5005
Nutrient Removal Solutions:

- **ACTIFLO®** Phosphorus removal for tertiary treatment and wet weather treatment
- **AnoxKaldnes™** Retrofit existing aeration basins to achieve biological nitrogen removal
- **ANITA™ Mox** Removes up to 90% of ammonia in high strength waste streams without carbon addition
- **NEOSEP® MBR** provides superior effluent for new or upgraded facilities
- **BIOSTYR®** High rate biological filter for nitrification or denitrification
- **BIO-DENITRO®** Phased, continuous flow process for enhanced TN removal without internal recycle
- **Hydrotech Discfilter** Achieve effluent TP levels as low as <0.1 mg/L

Kruger offers customized Nutrient Removal solutions that are highly versatile to meet the demands of any BNR/ENR application.

www.krugerusa.com
The winter that wouldn’t leave. I think that is how we are all feeling about the weather we have all experienced over the past few months. To those of you who operate our facilities, ensure our collection systems are functional, manage our storm water, or perform any other outdoor duties, I personally thank you. Even in situations of severe weather, you continue to ensure we consistently meet the high expectations of water professionals everywhere.

As things begin to warm up, we will all begin to look to the waterways of Virginia for relaxation, recreation, and renewal. Many of us will spend time this spring and summer tubing on the James, New or Roanoke Rivers, fishing Smith Mountain Lake, enjoying the Potomac and other rivers of northern Virginia or surfing and kayaking the Chesapeake Bay and Atlantic coast. Water environment professionals, in all capacities, contribute to the wellbeing of our waterways, and we should take pride in being part of such a broad based and important field of work.

As a VWEA volunteer, there are many ways to for us to enhance our personal stewardship of the environment. In some cases, the impact and results are direct, such as through participation in community service projects, usually planned by our young professionals or regional activities committees. In other cases, such as participating in committee meetings, presentations and/or attendance at conferences, and networking events, seeing a tangible benefit may be more difficult. As we continue to collaborate and expand our knowledge base through participation in these activities, we are able to do our jobs better. As we exchange ideas and tap into each other’s expertise, we grow and build upon a philosophy of improvement that ultimately contributes to our abilities to make positive impacts on the environment.

The 2014 VWEA conference season got off to a busy start with the Industrial Waste and Pretreatment (IW&P) Conference held in Charlottesville at the beginning of March. There were quite a few weather related variables for the committee to overcome to ensure the success of the event. I want to give a special thank-you to Kathy Rabalais, our VWEA Association Administrator, and the IW&P Committee for staying so positive and coming up with creative solutions to ensure approximately 100 attendees had a rewarding conference experience. In addition, VWEA members have had opportunities to interact with the next generation of professionals through judging science fairs across the state. From what I understand, many of the projects judged have been highly innovative, and show a promising future for our industry.

I look forward to seeing many of you and sharing in learning at the many VWEA events scheduled through the spring and summer, culminating with WaterJAM 2014.

As we exchange ideas and tap into each other’s expertise, we grow and build upon a philosophy of improvement that ultimately contributes to our abilities to make positive impacts on the environment.
The 26th Annual Potomac River Watershed Cleanup Sponsored by the Alice Ferguson Foundation occurs typically every spring. Members of VWEA and VA AWWA Joint Young Professionals Committee and Fairfax Water hosted a cleanup site at a community park located in Tyson’s Corner area of Northern Virginia. The cleanup was a success collecting more than 17 bags of trash/recyclable items.

Northern VA YP Members Helping to Make a Difference

YPs and community members team up to clean up!

The 26th Annual Potomac Watershed Cleanup at Scott’s Run Community Park. Pictured l-r/top to bottom: Dean Westman, Jennifer Walsh, Matt Swinsky, Rachael Movley, Kris Kasulis, Saurabh Raje, Michelle Siminari, Phil Yi, Dani Erbe, Ross Knoblauch, Greg Prelewicz (not pictured: Annie Bridges, Eric LaRocque).

Volunteers Kris Kasulis, Jennifer Walsh, and Michelle Siminari.

Volunteers Dani Erbe, Saurabh Raje, and Matt Swinsky.

Skull of animal found during cleanup. Quote of the day: “What animal is that?”

Heyward, Inc. | (804) 965-0086 | mmorgan@heywardinc.com

A Powerful Resource
EXPERTS IN LIQUID/SOLID SEPARATION

Heyward, Inc. | (804) 965-0086 | mmorgan@heywardinc.com
THANK YOU TO OUR SPONSORS

Gold

AquaLaw

ATKINS

Brown and Caldwell

Hazen and Sawyer

Environmental Engineers & Scientists

Greeley and Hansen

CDM Smith

Infilco

McGuireWoods

RK&K

Silver

Austin Brockenbrough & Associates

Bowman Consulting

C. Allan Bamforth

Combs & Associates

Reid Engineering

URS Corporation

WW Associates

Woolpert
Integrated Water Solutions
Wastewater Treatment & Biosolids Management
Water Supply & Treatment
Wet Infrastructure
Program / Construction Management
Design-Build

For more information:
Dan.Coleman@obg.com
(757) 754-0502 | www.obg.com

MARYLAND
Bowie / Hunt Valley

VIRGINIA
Virginia Beach / Richmond
and offices throughout the U.S.

Coyne Environmental is uniquely positioned with the most comprehensive collection of treatment options available to assist the wastewater treatment industries in meeting your specific goals.

Products and Services Provided
- Biosolids Separation Studies
- BOD / COD / TSS Reduction
- Carbon Source Selection
- Chemical Application Selections
- Coagulation / Flocculation Evaluations
- Heavy Metals Precipitation
- Laboratory & On-Site Testing
- Odor Control Evaluations
- Oil & Grease Control
- Phosphorus Removal Studies
- Polymer Application Evaluations
- Start Up Supervision

Coyne Chemical Environmental Services, 3615 State Road, Croydon, PA 19021 215-765-3000
www.coyneenvironmental.com
As spring arrives, we wrap up a busy winter for VWEA. We held two very successful conferences in March. The Industrial Waste and Pretreatment Conference celebrated 30 years. The weather tried to provide an obstacle, but the diligent work of our volunteers ensured a quality program was provided to our attendees. Thank you again to Jim Johnston, and the entire committee, for a job well done!

Also in March, the Stormwater Committee provided a top-notch seminar attended by over 180 professionals and 20 exhibitors. The morning session covered MS4 permitting strategies and challenges with compliance, and the afternoon covered innovative funding strategies. The committee has developed a half-day workshop on stormwater issues for this year’s WaterJAM. Thank you to Carolyn Howard, and the rest of the committee for making VWEA the go to organization for stormwater training needs.

As VWEA continues to flourish, we are consistently working on improving the way we communicate. One of the biggest changes has been in online communications. Our monthly e-newsletter has become an important vehicle to provide timely information on association activities. We have also leveraged social media to reach our members. If you use social media, please follow us on Twitter (VirginiaWEA), Facebook (Virginia Water Environment Association) and our LinkedIn group. It is an easy way to stay connected and ensures you don’t miss any of the fun!

Have you visited VWEA’s website recently? There is a wealth of information available to members including job listings, conference proceedings, information on training opportunities, committee listings, contacts and much more. We have added a tab on our quick links to make volunteering for the association simpler. Click the tab and fill out the form. Your email will be forwarded to the appropriate committee liaison based on your interests.

Last year we developed an online forum for operators. The forum will allow online collaboration between water quality professionals across Virginia. Users can post questions on treatment and process issues, regulatory compliance, collection system maintenance, etc. in order to gain assistance or advice from other operators/engineers. We encourage members to use the resource and expand their knowledge base by sharing with others (http://www.vwea.org/opsforum).

All of the efforts we make would not be possible without our Corporate Sponsors and we are grateful for their continued support. Please take a look at page 10 for a listing of 2014 sponsors. Their support resulted in VWEA putting $16,400 directly in our Scholarship Fund. We look forward to another great year!
Degremont Technologies offers trusted, globally proven solutions for your water treatment challenges.
The VWEA Scholarship Committee has six scholarships available for this year to operators and students, including one for high school students interested in engineering or in the physical/environmental science fields.

**Sonny Roden Memorial Scholarship**
This is available to students enrolled at Virginia universities in an environmental engineering or science graduate program. There is a single award of $2000 available and the deadline to apply is May 16, 2014.

**Undergraduate Student Scholarship**
This is available to students enrolled at Virginia universities in a civil or environmental engineering or physical/environmental science undergraduate program. There is a single award of $2000 available and the deadline to apply is May 16, 2014.

**Rising Freshman Scholarship**
This is available to students graduating from high school in 2014 and planning on enrolling at a Virginia college or university in a civil or environmental engineering or physical/environmental science undergraduate program. There is a single award of $2000 available and the deadline to apply is May 16, 2014.

**Operators Scholarship**
This is available to operators employed in the wastewater treatment field at a utility in Virginia. The award shall be a total of $2,000 applied to sending a total of three (3) operators to the Wastewater Treatment Plant Operators Short Course scheduled for August 11-16, 2013 at Virginia Tech. The deadline for submitting applications is June 27, 2014.

**Member Dependent Scholarship**
This is available to students enrolled at Virginia universities in a civil or environmental engineering or physical/environmental science undergraduate program who are children of current VWEA members. There is a single award of $2000 available and the deadline to apply is May 16, 2014.

**Future Operator Scholarship**
This is available to students with plans to pursue a career in wastewater treatment plant operations and maintenance, utility operations and maintenance, or applicable laboratory sciences. There is a single award of $2000 available and the deadline for submitting is July 18, 2014. The applications can be found on the WVEA website under the Scholarship link at the top. Please note the submittal deadlines for each scholarship and send in your completed applications to: Jessica Hou at jhou@gfnet.com and Kathy Rabalais at admin@vwea.org. Thank you, and we look forward to your applications!

---

**HDR**
**Infrastructure Expertise for the Real World**

HDR can help you develop proactive asset management and infrastructure condition assessment programs to focus your O&M resources on the right assets at the right time. Using a data-driven approach results in proven benefits: failure mitigation, useful life extension and justifiable capital expenditures.

To learn more, contact [water@hdrinc.com](mailto:water@hdrinc.com).
WaterMaster® Fire Hydrants and FlowMaster® RW Gate Valves, including current inventories, are compliant with the Reduction of Lead in Drinking Water Act of 2011 and meet or exceed AWWA standards.

Learn more at ejco.com or call 800 626 4653
East Jordan Iron Works is now EJ

If the challenge involves water, we’re up for it. We offer you a world of expertise, with value for today and foresight for tomorrow, for all of your unique water challenges. We’re building a world of difference. Together.

Arlington 703-243-0938
Virginia Beach 757-202-8402
WeKnowWater@BV.com

Consulting • Engineering • Construction • Operation | www.bv.com

You can’t afford not to look.

Have you ever looked at the true cost of ownership for your lift stations? When you see beyond initial purchase price to other life-cycle costs like installation, pump efficiency and power draw, operation and maintenance, associated labor time and equipment, and parts, you will appreciate the Smith & Loveless approach. Our operator-safe, above-grade Wet Well Mounted Pump Stations with long-lasting, highly-efficient S&L Non-Clog Pumps deliver the lowest lift station operating costs – including 50% savings vs. submersibles.

Represented locally by:
Commonwealth Engineering & Sales
info@CommEngSales.com
(866) 773-0008

See for yourself. Request a view at your facility with a visit from one of our traveling demo Pump Stations at SmithAndLoveless.com.
Come join us in September for WaterJAM – the Joint Annual Meeting of the Virginia Section American Water Works Association and the Virginia Water Environment Association! Since 2002, WaterJAM has been a record-setting conference registering growing numbers of participants each year. More than 1,300 professionals have joined their friends and colleagues in each of the past two years to make WaterJAM one of the most successful state conferences in the United States.

This year’s theme, “Splashdown 2014,” is perfectly suited to the conference location in Hampton, Virginia, home of the NASA Langley Research Center, Langley Air Force Base and the Virginia Air and Space Center. And this year’s WaterJAM promises the latest in technology, to help you advance your knowledge in this highly technical world while you have a little fun along the way.

Your WaterJAM Planning Committee has been working tirelessly over the past few months, and will continue doing so, to fulfill our mission:

- Plan and implement a comprehensive conference that brings together technical excellence and innovation while supporting networking opportunities at an exceptional value to all attendees.

A tremendous team is working on your behalf to plan this year’s WaterJAM, and our goal is to exceed your already high expectations for this annual event. Many new committee members have brought new life and excitement into this process which will be reflected when you join us in Hampton later this year!

We have partnered with the Hampton Roads Convention Center (HRCC) and Embassy Suites in Hampton to host our activities from September 8-11, 2014. Conveniently located between Richmond and Virginia Beach, the HRCC is near the Peninsula Town Center with its numerous shops, restaurants, trendy boutiques, nightlife and other entertainment attractions. This area has undergone a renaissance of sorts since WaterJAM was last in Hampton in 2008, making it the perfect time for us to return. We anticipate over 1,400 professionals coming together to present new ideas, update you on current regulatory initiatives, and discuss industry hot topics that we face in our water and wastewater world.

VA AWWA/VWEA Joint Annual Meeting

Winter’s over, spring is here, and it’s time to start planning your late summer! Plan on gathering with friends, both old and new, and other industry professionals in Hampton at Splashdown 2014! We have partnered with the Hampton Roads Convention Center (HRCC) and Embassy Suites in Hampton to host our activities from September 8-11, 2014. Conveniently located between Richmond and Virginia Beach, the HRCC is near the Peninsula Town Center with its numerous shops, restaurants, trendy boutiques, nightlife and other entertainment attractions. This area has undergone a renaissance of sorts since WaterJAM was last in Hampton in 2008, making it the perfect time for us to return. We anticipate over 1,400 professionals coming together to present new ideas, update you on current regulatory initiatives, and discuss industry hot topics that we face in our water and wastewater world.
As a testament to WaterJAM’s successful history, we had another huge response to our Call for Papers for 2014. With more than 330 abstracts submitted, our Technical Program Co-Chairs, Phill Yi and Steven Cook and Vice Co-Chairs, Aditya Ramamurthy and Evan Bowles, worked exceptionally hard to put together another comprehensive technical program with something for every attendee. Due to this overwhelming response and the quality of the abstracts, this year’s Technical Program will once again offer ten concurrent sessions, for a total of 194 presentations to be given over three days.

Some of the sessions offered this year will include: Nutrient Removal and Recovery, Emerging Technology, Alternative Project Delivery, Water and Wastewater Treatment, Biosolids Management and Solids Handling, and two sessions each on Sustainability, Stormwater Management, and Asset Management. We’re certain there’ll be something for everyone offered in this diverse program! Furthermore, the large number of presentations will allow numerous opportunities for professional engineer and operator educational credits.

Meanwhile, Local Arrangements Co-Chairs, Stewart Lassiter and Troy McPherson, Vice Co-Chairs, Muriel Rodriguez and Julie Ball, and their well-oiled machine of volunteers from both VA AWWA and VWEA have been hard at work ensuring that your conference experience provides MUCH more than just technical growth. The committee is focused on providing activities that give participants opportunities to network, socialize, learn, and have fun – all hallmarks of recent successful WaterJAMs. While it’s a little early to provide details, there is no doubt this year’s conference will be as memorable as ever.

As always, we strive for excellence in both technical and social WaterJAM activities, and this year will be no different. As such, we’ve selected the Riverfront Golf Course in Suffolk, Virginia to host our Golf Outing this year. In addition, the ever-popular Clay Shoot will continue to be held at Old Forge Sporting Clays in Providence Forge. These events are sure to provide loads of competition, hole sponsorship opportunities, and chances to win excellent prizes provided by generous local businesses as well our own water and wastewater community.

For those who would rather stimulate his/her intellect, we’ve planned some Monday workshops that will provide attendees the opportunity for additional education and collaboration. These workshops will cover timely topics, including Lab Practices as well as Pressure Pipe Condition Assessment.

After your day of golfing, clay shooting, or enjoying the workshops, join your friends at our host hotel, the Embassy Suites, for the Meet and Greet as we kick off the conference in style with great food and fantastic music. Your friendly WaterJAM Co-chairs will be exchanging our Richmond pit crew suits for flight suits in Hampton, so be sure to come by and say hello. Don’t miss this event, or you’ll likely have your friends telling you the next morning how much fun you missed!

The General Opening Session will begin Tuesday with a keynote speaker from NASA and featured speaker from Fort Monroe. Technical sessions will follow on Tuesday afternoon, all day Wednesday, and Thursday morning. Tuesday night will remain a free night for consultant and vendor outings or simply to enjoy at one of the local eating and nightlife establishments.

As always, the pinnacle of the conference is Wednesday night’s Award Banquet and Fun Night, which will be held at the HRCC. The pre-dinner reception is a great opportunity for informal networking, while the awards dinner provides a formal setting for recognizing outstanding achievements in the water and wastewater industry.

Don’t forget to make plans early and secure your registration now. WaterJAM 2014 promises to be an event you won’t want to miss!
time to mingle with friends and colleagues, and a perfect opportunity to meet our WEF and AWWA national representatives. After dinner, it’s always exciting to recognize the top performers in our profession with prestigious awards. Once the banquet is finished, it will be time to let loose and have some fun! Think of our “Splashdown” theme and let your imagination run wild! More to come on these fun games and activities!

The Young Professional (YP) Committee is as active as ever for this year’s WaterJAM. The YP Planning Committee is striving to make WaterJAM 2014 one of the best ever for new and current young professionals and students. They're currently planning the following events:

• Community Service Project – Planned for the Sunday, September 7, prior to the start of WaterJAM.
• Corn Hole Challenge – This event was a huge success last year. This year there will be three sets of boards set up in the Exhibit Hall to play on. The best part? You have a chance to win one of the sets of corn hole boards!
• YP Technical Session – An entire technical session showcasing current young professionals!
• YP Workshop – This year they will focus on engineering basics with industry experts providing unique insights into the core of our engineering business sectors.
• Poster Contest – Another great time to showcase students and YPs! The boards will be set up just outside of the exhibit hall. Watch for e-mails calling for abstracts; authors of winning posters will receive $1,000!
• YP Reception – Join other young professionals and students who represent the future of our industry in a relaxed atmosphere. This is a great opportunity to learn about YP activities and to get to know other YPs in varying fields. The YP Reception will be located in the Embassy Suites, prior to the Awards Dinner.

Further details for all YP events will be available in the summer issue of *The Conduit* and *Tap Into Virginia*. Also, stay on the lookout for a flyer that will help fellow YPs navigate How to Gain Approval to Attend Water JAM 2014. This document will be available on the VA AWWA and VWEA websites, as well in the summer issue of *The Conduit* and *Tap Into Virginia*. In the meantime, if you have questions or ideas, please contact our YP Liaison Ryan Clark at Ryan.Clark@kimley-horn.com.

Evoqua Water Technologies continues a 100-year tradition of helping consulting engineers and municipalities respond to market needs and evolving water standards.

Evoqua delivers high performance products for primary, secondary, tertiary and anaerobic treatment, as well as odor control, filtration and disinfection technologies with brands you know, including:

**ENVIREX • JET TECH • MEMCOR WALLACE & TIERNAN • JWIRJ ENVIRONMENTAL • DAVCO**

Our experts are ready to respond with solutions for new plants, upgrades, rehabs and OEM parts.

Search for “muni rep” at [www.evoqua.com](http://www.evoqua.com) to find a manufacturers’ representative near you.
won a national AWWA Education Award two years ago, is returning. This year it will be conducted at Hampton Bay Days in downtown Hampton on Sunday, September 7. Come out and support the team in educating the public about the value of water and the benefits our industry provides to our communities. Before you leave for home after your week in Hampton, we suggest you consider our combined water/wastewater treatment facility tour. This year, Gary Hart has arranged a tour of the Anheuser-Busch InBev water and wastewater treatment facilities! This tour will most likely be one of our most popular in history, but we only have 30 spots, so sign up early to reserve your space!

Keeping up with technology, WaterJAM has completely moved into the 21st century. Not only will we have a new and improved version of the WaterJAM app at this year’s conference (iOS and Android), but you can also start following us on Twitter (#WaterJAM) and find us on Facebook at www.facebook.com/VirginiaWaterJAM.

The WaterJAM 2014 conference is the premier event for Virginia water and wastewater professionals, and hotel rooms will move quickly, so make sure to register and book early (and save money in the process!). Registration opens online in early May, so be sure to check the VA AWWA and VWEA websites for registration information.

We are tremendously excited about this year’s WaterJAM and on behalf of your hard-working WaterJAM Planning Committee, we look forward to seeing you in Hampton in September! ☛

Respectfully yours,
Shawn “Maverick” Heselton and Paul “Goose” Delphos
WaterJAM 2014 Co-Chairs
Best Performance in the Industry for Plants from 2 to 500 MGD

Advanced Grit Management™
- Eutek HeadCell®
- Grit King®
- Grit Cup®
- SpiraSnail®
- Eutek SlurryCup™
- Eutek TeaCup®
- Eutek Grit Snail®

Sludge Screening
- Hydro-Sludge® Screen

Wet Weather / CSO Solutions
- Storm King®
- Reg-U-Flo® Vortex Valve
- Hydro Vortex Drop™ Shaft
- Hydro-Jet® Screen
- Heliscreen®
- Hydrc-Static® Screen

Stormwater Solutions
- Downstream Defender®
- First Defense®
- Up-Flo® Filter

www.sherwoodlogan.com

www.hydro-int.com
Silent Auction

In preparation of the WaterJAM 2014 silent auction, the Water Reach Committee would like to remind readers that solicitation of auction items has already begun. The silent auction serves as a fundraiser for various water and sewer projects the Water Reach Committee is involved in throughout Virginia.

Solicited auction items can be of a typical auction item nature such as paintings, framed photographs, sculptures, jewelry etc. Alternatively, if you are or know a business owner, goods and services can also be donated as auction items.

If you would like more information regarding donations or leave item suggestions, feel free to contact Noelle Slater, Water Reach Committee Vice Chair, by email Noelle.slater@arcadis-us.com.

For more information about the Water Reach Committee, please visit the committee’s VWEA website section at http://www.vwea.org/committees/water-reach.

---

 Splashdown 2014

Are you looking for ways to improve your water treatment efficiency? Increase biological process throughput and performance? Protect the integrity of your plant and collectors from sulfides corrosion? Decrease energy consumption? Kemira can help you solve these challenges and more. We aim to be a leading water chemicals supplier for raw and waste water applications, serving municipalities and water intensive industries. Together with our customers, we apply our knowledge and expertise to develop innovations that address the sustainable future of water.

Tel. +1 800 879 6353
us.info@kemira.com
www.kemira.com

Kemira
Where water meets chemistry
The SludgePro XL sampler is designed to handle tough, everyday use in plant conditions that cause similar models to fail. The SludgePro XL is marked with waterproof tape in 1 foot increments, with the bottom section numbered through 4 feet to simplify calculation of sludge levels. A tape strip package is also provided.
THE EXPERTS IN BIOGAS SYSTEMS

For over 50 years, Varec Biogas is the market leader in biogas safety, flaring & conditioning systems.

All of our equipment is designed to meet NFPA 820 & UL standards to ensure plant safety.

Our partnership with BioGasclean provides cost effective solutions in biogas conditioning.

Cover Equipment
Sales Representative:
Bown, Callahan & Associates
828 Dublin Valley Rd. Ste. 7
Towson, MD 21207

Flare Systems
1-866-4-BIOGAS
www.varec-biogas.com

Gas Conditioning Systems
Sales Representative:
Combs & Associates, Inc.
16191 Dunhams Ferry Place
Mechanicsville, VA 23116
On Thursday, September 11, 2014 (following the JAM technical sessions) the Sustainable Utilities Committee will host a tour of Poquoson Garden Atriums, a unique self-sustaining community located in the heart of Poquoson. The tour will begin with lunch at Surf's Up restaurant where Dr. Stuart W. Rose will provide a brief introduction of the community as tour participants dine on fresh seafood. After lunch the tour will proceed to the Gardens. From an aquaculture pond to indoor heat sinks, the Gardens (http://www.gardenatriums.com/poquoson.htm) is a lovely, carefully planned and skillfully constructed community that has sustainable elements incorporated throughout its design.

The tour will focus on the technological aspects of the community’s sustainability practices including water management (i.e., storm water collection, BMPs, and reuse), water treatment (i.e., biological and mechanical filtration and reverse osmosis) and zero cost power via energy capture (solar panels) and storage (photovoltaic batteries). It will also focus on indoor air quality, the relationship between air quality and building material, and air purification via indoor plants. Finally, the tour will touch on some of the permitting challenges associated with taking the community off of the utility grid.

Tour Guide Credentials:
"Stuart W. Rose, Ph.D., earned his doctorate in Organization Development, has been a professor at three major universities, and has worked for several decades as an educator and a consultant to architects, consulting engineers, and other design professionals. He is a registered architect, as well as a graduate structural engineer. For nearly 20 years he has tracked trends related to the ability to sustain life on Earth and has initiated a unique pilot project of sustainable housing. His Garden Atriums project has been featured in nearly two-dozen local, regional, and national newspapers and magazines, on NPR, PBS, and on major regional television programs. Rose has presented his work and his expertise at three international sustainability conferences." (Text source: Amazon.com, reprinted with author’s permission.)

Please contact Felicia Glapion (fglapion@hazenandsawyer.com) for more information.

This interior home atrium is surrounded by other living spaces (kitchen, home office, bedrooms, etc.) and functions as a heat sink for the home. It, along with other features, such as solar panels and insulating materials, allow dwelling occupants to forgo air conditioning and heating for seven months out of the year.
Do you have questions...?

Do we have i & i here?

What is the current water level at this lift station?

Is this flow meter accurate?

Is there a blockage on this section?

Can we measure flow accurately at this location?

We have solutions!

Flow • SL-RAT™ • SCADA • Calibrations

Call us now: 757 286-7182
The Prince William County Service Authority has found a quicker, more convenient way of monitoring sewer infrastructure located near water.

When the Virginia State Department of Environmental Quality started becoming more stringent on sanitary sewer discharges into state-owned bodies of water, the Service Authority decided to change its way of inspecting sewer pipe close to the shoreline.

Last August, the Service Authority began a pilot program in which a new pole-mounted camera technology is used to inspect sewer lines near the shore. By using this pilot program, the Service Authority is not only troubleshooting any potential problems with the sewer, but also doing it in a cheaper, more efficient manner.

In the past, multiple crews would inspect sewer lines, manholes and easements in areas near the water. That meant a lot of “stepping on each other’s feet” per Infiltration and Inflow Manager Rob Wilson.

Now, instead of having multiple crews taking a video camera van to remote and nearly inaccessible areas, the Service Authority sends out a two-man team made up of one Collection and Distribution staff member and one Infiltration and Inflow Department staff member to do multiple jobs on the same site.

This includes placing a recently purchased 25-foot pole camera with a high intensity light and zoom lens into the entrance of a sewer line for an initial inspection. While the Infiltration and Inflow employee checks out the pipe with the camera, his partner can assess the condition of the manholes and has the equipment on hand to maintain the easement if it is overgrown.

Camera van crews can come back later to more thoroughly inspect the lines.
"With the new, easier-to-use technology, crews can inspect double the amount of line in a year than with a traditional van-installed camera."

or take corrective action such as installing cured-in-place-pipe to protect the pipe from further damage caused by tree root intrusion or other destructive elements.

With the new, easier-to-use technology, crews can inspect double the amount of line in a year than with a traditional van-installed camera, according to Operations and Maintenance Director Don Pannell. “Having something portable to get a quick look in a pass-fail type of assessment of the pipe is really valuable,” per Pannell.

It should be noted that Service Authority’s Geographic Information Systems Department plays a large role in the pilot program by creating detailed maps of each sewershed in the county. Each sewershed map displays the manholes that are in close proximity to bodies of water. Work orders are then generated for each sewershed and given to the inspection crews.

According to Wilson, the only downside to the new pole cameras is the variance of the pipes themselves. “Rarely do you get a uniformly straight pipe from one manhole to the next. Consequently, you are only able to see what the pipe lets you see,” per Wilson.

The new system of preventive maintenance has already reaped dividends for the Service Authority. Last fall, a crew discovered a manhole filled with rocks and tree debris – an obstruction that Wilson said would have certainly caused a backup had it not been discovered by the crew assigned to that area.

What if your energy savings paid for your plant improvements?

ARCHITECTURE ENGINEERING PLANNING ENERGY SERVICES CONSTRUCTION MANAGEMENT

Innovative Design Solutions

Energy Performance Contracting

WASHINGTON, DC - 703.299.8718 / RICHMOND, VA - 804.308.9670

PITTSBURG TANK & TOWER MAINTENANCE CO., INC.

SAVE! We have a crew in YOUR AREA!

Inspections Wet Dry ROV Repair In Service Cleaning Plant Insulation New & Used Recommissioning Uplifts Storage Pump Station Tank Elevated Underground Ground Storage

ROV inspections can be viewed on TV console during inspection & DVD provided. All inspections include bound reports, recommendations and cost estimates.

Vicky Caudill
270-826-9000 Ext. 107
www.watertank.com
Mark your calendars for the 2014 Herb Evans Memorial Golf Tournament to be held on Thursday, May 15. Come join us and help support Water For People while enjoying a round of golf at one of the following prestigious courses:

- Golden Horseshoe Golf Club in Colonial Williamsburg, VA
- Bull Run Golf Club in Haymarket, VA
- Hanging Rock Golf Club in Salem, VA

This year, for the first time, the first 80 players to sign up for the Golden Horseshoe Golf Club will have the “Golden Opportunity” to play the Gold Course! Don’t miss this amazing opportunity. Early registration is open for the Golden Horseshoe at https://www.regonline.com/2014WFP_HEvanGolfClassic. Registration for the other courses will open soon.

Sign up individually or as a foursome. Sponsorships opportunities are also available. This event is hosted jointly by the VA AWWA/VWEA and Washington, D.C. Water For People Committees. All proceeds are donated to Water For People.

Water For People works together to share the heartfelt vision of a world where all people have access to safe drinking water, adequate sanitation, and basic health services, and where no one suffers or dies from a water or sanitation related disease. Water For People works with people and partners to develop innovative and long-lasting solutions to the water, sanitation, and hygiene problems in developing nations all over the world. To learn more about Water For People please visit, www.waterforpeople.org.

For information about the tournament or sponsorship opportunities, please contact Michael Dreiling at mdreiling@gmail.com or 804-665-1106.

---

Need to **Save** Time and **Reduce** Costs? Consider **Design Build** via the PPEA approach . . .

**Sustainable Solutions**
- Wastewater Treatment
- Biosolids & Sludge Treatment
- Enhanced Nutrient Removal
- Water/Sewer Infrastructure
- Water Reuse Systems
- Pretreatment

**Reid Engineering Company, Inc.**
Environmental & Civil Engineering Consultants
www.ReidEngineering.com
**Environmentally and Economically Responsible Engineering**

**Quality | Value | Commitment**

**540-371-8500**
Contact: **Shane Reid, P.E.** at sreid@reidengineering.com
1210 Princess Anne Street • Fredericksburg, Virginia 22401
MOVING, TREATING AND STORING WATER. WITH EXCELLENCE.

Our reputation didn’t just happen. It’s been built project by project for over half a century.

As we’ve performed municipal, private, and industrial work through integrated project delivery methods such as Design-Build and CMAR, people across the country have come to depend on us for quality, integrity, and customer satisfaction — The Garney Way. Garney is your total water solutions provider. Let us help solve your water issues.

WATER AND WASTEWATER TREATMENT FACILITIES / WATER AND WASTEWATER PIPELINES / PUMPING FACILITIES / WATER STORAGE / HEAVY CIVIL / INDUSTRIAL

Red Top to Lake Gaston WTP Raw Water Transmission Main
CHESAPEAKE, VA

Western Wake Water Reclamation Facility Solids Handling Facility
NEW HILL, NC

Loudoun Water 30" Waterline Route 637 & Ashby Ponds
ASHBURN, VA

Background photo taken at Forsyth County Membranes Water Treatment Plant

KANSAS CITY, MO 816.741.4600
ATLANTA, GA 770.754.4141
DENVER, CO 303.791.3600
NASHVILLE, TN 615.350.7975
ORLANDO, FL 407.877.5903
PHOENIX, AZ 602.470.0001
VWEA’s Sustainable Utilities Committee will be sponsoring a webinar on Sustainable Construction Waste Management Webinar in May.

Sustainable Construction Waste Management significantly reduces materials going to the landfill and can also generate a small revenue stream by recycling construction waste. Lisa Racey, with AlexRenew and other representatives from the public and private sector, will speak on their recent construction waste management efforts.

Learning objects: Following the webinar, attendees should be able to:
• Describe the purpose and benefits of a Construction Waste Management Plan (CWMP).
• Understand the role and requirements for the designer, contractor and owner in implementing a CWMP.
• Describe the materials that can be recycled and how to minimize construction waste.

Design • Innovate • Build • Deliver

For more than 65 years, Parsons has provided comprehensive services to municipal customers throughout the world. Today, we continue to evolve to meet the changing demands of the municipal marketplace—working to provide innovative solutions to our customers’ challenges.

3926 Pender Drive, Suite 100
Fairfax, Virginia 22030
(703) 934-2300
Contact: Patrick.Brooks@parsons.com

www.parsons.com
Mission managed SCADA systems are designed to get you up and running in hours, not days. Our packages start at around $1,000 with a maintenance fee of less than $1 a day. Mission strives for ease in doing business. Give us a try – no bureaucratic red tape, no huge commitment. If you like it, buy it. If not, send it back. It’s that simple.

Mission flexibility allows you to expand your system as you are ready and on your terms. Mix and match any of our products one at a time or all at once, the choice is yours. That is why you will find Mission SCADA in over 1,400 municipalities across the United States and Canada.
**ALPHA DIRECTORY**

<table>
<thead>
<tr>
<th><strong>TREATMENT PROCESS</strong></th>
<th><strong>CLARIFICATION</strong></th>
<th><strong>DIGEST / BIOSOLIDS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixing Systems Sequencing Batch Reactors</td>
<td>Legacy Environmental Package Wastewater Plants</td>
<td>RDP Technologies Hybrid Evaporators, Lime Stabilization</td>
</tr>
</tbody>
</table>

**AERATION / MIXING**

| GE Energy (Roots) Turbo Blowers, PD Blower Packages, S&Airoflo Floating brush rotor aeration | **Grundfos** Digital, Diaphragm Dosing Pumps | **Stenner** Peristaltic Pumps |
| **LMI** Solenoid Activated Diaphragm Pumps |

**GAS HANDLING**

| Robyson Group **VanAire** Digger and Landfill Gas Cleaning Systems, Micro Turbines | Shand & Jurs Biogas Digger Gas Safety Equipment and Waste Gas Burners |

**PUMP EQUIPMENT**

| Tigerflow Packaged Water Pump Systems | **Grundfos** Digital, Diaphragm Dosing Pumps | Plasti-Fab FRP Flumes & Metering Manholes |
| Gator Prime Self priming pumps | **Stenner** Peristaltic Pumps | Measurement Specialties Pressure and Level Measurement |
| Dakota Pump Packaged Water Pump Systems | **LMI** Solenoid Activated Diaphragm Pumps | **Hanna Instruments** Test Kits, Hand Held Meters |

**VALVES / GATES**

| Plasti-Fab FRP Gates, Logs and Skimmers | Oda-Killa by Suncoast Ozone Feed to Control H2S odors | Insite IG DO, TSS, pH, ORP |
| Belco Manufacturing FRP Dampers | DOer FOG Treatment, Calcium Nitrate Feed for H2S, Turn-Key Service | **EMCO Flow Systems** Flow Meters |
| **VanAire** Ozone Generation Systems |

**SCADA / CONTROLS / VFDs**

| Lord and Company Complete SCADA Integration | Suncoast PLC and VFD Custom Controls is **Hanna Instruments** Pressure and Level Measurement |
| Danfoss VFDs and Soft Starters | **Maid Labs** Power Analyzers | |
| Custom Control Tech. Custom Control Panels | |

**INSTRUMENTATION**

| **S::CAN** Full Line of Reagentless Analyzers | **Telogy Isco** Samplers and Open Channel Flow | **PCI** Liquid Oxygen Systems |
| **SeaMetrics** Palladium Wheel Turbines | | **VanAire** Gas Handling Contact UV Disinfection |
| **Hanna Instruments** Test Kits, Hand Held Meters | |

**SCREENS**

| **OR-Tec** Variety of Screens | **RDP Technologies** Sand or Jurs Biogas Digger Gas Safety Equipment and Waste Gas Burners |
| **Lord and Company** Complete SCADA Integration | **Plasti-Fab** FRP Flumes & Metering Manholes |
| **Mission Communications** Wireless Telemetry and SCADA Systems | |

**FIELD SERVICE / MAINTENANCE PROGRAMS**

| **Insite IG** DO, TSS, pH, ORP | Turnkey, Full Service Ozone Generation Systems |

**FILTERS**

| **ECC, Incorporated** Floating Ball Covers | **PCI** Liquid Oxygen Systems |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | |
| **Robinson Group** Paddle Wheel Turbines | **VanAire** Gas Handling Contact UV Disinfection |

**DISINFECTION**

| **Enaqua** Non-Contact UV Disinfection Systems | **RDP Technologies** Sand or Jurs Biogas Digger Gas Safety Equipment and Waste Gas Burners |
| **CEC, Incorporated** Floating Ball Covers | **Plasti-Fab** FRP Flumes & Metering Manholes |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | **VanAire** Gas Handling Contact UV Disinfection |

**SPECIALTIES**

| **Plasti-Fab** FRP Flumes & Metering Manholes | **VanAire** Gas Handling Contact UV Disinfection |
| **ECC, Incorporated** Floating Ball Covers | **Plasti-Fab** FRP Flumes & Metering Manholes |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | **VanAire** Gas Handling Contact UV Disinfection |
| **Robinson Group** Landfill Gas Cleaning Systems | **VanAire** Gas Handling Contact UV Disinfection |

**FILTERS**

| **Enaqua** Non-Contact UV Disinfection Systems | **PCI** Liquid Oxygen Systems |
| **CEC, Incorporated** Floating Ball Covers | **VanAire** Gas Handling Contact UV Disinfection |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | **VanAire** Gas Handling Contact UV Disinfection |

**DISINFECTION**

| **Enaqua** Non-Contact UV Disinfection Systems | **PCI** Liquid Oxygen Systems |
| **CEC, Incorporated** Floating Ball Covers | **VanAire** Gas Handling Contact UV Disinfection |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | **VanAire** Gas Handling Contact UV Disinfection |

**SPECIALTIES**

| **Plasti-Fab** FRP Flumes & Metering Manholes | **VanAire** Gas Handling Contact UV Disinfection |
| **ECC, Incorporated** Floating Ball Covers | **Plasti-Fab** FRP Flumes & Metering Manholes |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | **VanAire** Gas Handling Contact UV Disinfection |
| **Robinson Group** Landfill Gas Cleaning Systems | **VanAire** Gas Handling Contact UV Disinfection |

**FILTERS**

| **Enaqua** Non-Contact UV Disinfection Systems | **PCI** Liquid Oxygen Systems |
| **CEC, Incorporated** Floating Ball Covers | **VanAire** Gas Handling Contact UV Disinfection |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | **VanAire** Gas Handling Contact UV Disinfection |

**DISINFECTION**

| **Enaqua** Non-Contact UV Disinfection Systems | **PCI** Liquid Oxygen Systems |
| **CEC, Incorporated** Floating Ball Covers | **VanAire** Gas Handling Contact UV Disinfection |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | **VanAire** Gas Handling Contact UV Disinfection |

**SPECIALTIES**

| **Plasti-Fab** FRP Flumes & Metering Manholes | **VanAire** Gas Handling Contact UV Disinfection |
| **ECC, Incorporated** Floating Ball Covers | **Plasti-Fab** FRP Flumes & Metering Manholes |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | **VanAire** Gas Handling Contact UV Disinfection |
| **Robinson Group** Landfill Gas Cleaning Systems | **VanAire** Gas Handling Contact UV Disinfection |

**FILTERS**

| **Enaqua** Non-Contact UV Disinfection Systems | **PCI** Liquid Oxygen Systems |
| **CEC, Incorporated** Floating Ball Covers | **VanAire** Gas Handling Contact UV Disinfection |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | **VanAire** Gas Handling Contact UV Disinfection |

**DISINFECTION**

| **Enaqua** Non-Contact UV Disinfection Systems | **PCI** Liquid Oxygen Systems |
| **CEC, Incorporated** Floating Ball Covers | **VanAire** Gas Handling Contact UV Disinfection |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | **VanAire** Gas Handling Contact UV Disinfection |

**SPECIALTIES**

| **Plasti-Fab** FRP Flumes & Metering Manholes | **VanAire** Gas Handling Contact UV Disinfection |
| **ECC, Incorporated** Floating Ball Covers | **Plasti-Fab** FRP Flumes & Metering Manholes |
| **Belco Manufacturing** FRP Tanks, Ductwork and Dampers | **VanAire** Gas Handling Contact UV Disinfection |
| **Robinson Group** Landfill Gas Cleaning Systems | **VanAire** Gas Handling Contact UV Disinfection |
TRUSTWORTHY:  
(adj.)– an environmental lab built on a reputation for reliable results.

Experienced, accurate, accountable…

NPDES Monitoring
Drinking Water Analyses
Groundwater Monitoring Programs
Whole Effluent Toxicity Testing
Biological Assessments

Regular sample pick-up available from our lab courier fleet serving central and western Virginia.

ROANOKE SERVICE CENTER
3029-C Peters Creek Rd • Roanoke, VA 24019
540-777-1276

SHENANDOAH SERVICE CENTER
1557 Commerce Rd • Verona, VA 24482
540-248-0183

CORPORATE HEADQUARTERS
225 Industrial Park Road • Beaver, WV 25813
800-999-0105

REIC
… your full service environmental laboratory
800-999-0105 • www.reiclabs.com

BECKLEY, WV • MORGANTOWN, WV • ASHLAND, KY • ROANOKE, VA • STAUNTON, VA
As water and wastewater operators, we all-too-often think of problem-solving math in terms of licensing exams. With computer spreadsheets, SCADA systems, and all types of calculating software, our math skills can become quite rusty, due to minimal – if any – use!

Here is a real-life example that occurred within the last several months that demonstrates how using math can solve not only exam or training problems, but real-world, major operational issues as well. I was involved in helping a wastewater treatment plant track down the source of approximately 5 MG a month of unaccounted-for influent flow. The influent stream is generated at a correctional facility, the sole source of this treatment plant’s influent flow. In an average 28-day period, the WWTP was treating, on average, 10.12 MG. This influent flow effectively matched the average 10.0 MG effluent flow. The correctional facility was certain the flow was not coming from their operations, as they pointed out that their average potable water purchased from the local municipality was consistent at 5.0 MG. This purchased water is the only source of water at that correctional facility. The logical starting point was to have all the involved flow meters (water and wastewater) calibrated and checked for accuracy.

The correctional facility has its own water storage tank that provides water for usage. This private tank draws water from the nearby municipal storage tank on an automatic basis (level activated) to maintain normal tank operating levels and pressure. These automatic fill cycles occur eight times each day (24/7). As the tank fills, water drawn from the municipal tank passes through two side-by-side water meters. These meters register the total gallons drawn from the municipal tank entering the correction facility tank each cycle. One meter is on a two-inch line and the other meter is on a four-inch line. The calibration and accuracy of both the potable water meters checked out as perfect. There was no malfunction of either meter.

Next, the WWTP influent flow meter was checked and again the calibration and accuracy proved to be right on the money. With all three flow meters proving to be accurate, this average 5.0 MG monthly unaccounted-for flow continued. Investigation completely ruled out any I & I issues or the contribution being from any other outside source.

This is where math investigation proved successful in pinpointing the source of the influent flow. By working the information given on the next page, it was unquestionably documented that the additional 5 MG per month flow was in fact, coming through the correctional facility, to the WWTP.
THE CASE OF THE MISSING INFLUENT

WORKSHEET

Your name: ____________________________________________________________

Your employer: _______________________________________________________

Your work address: ____________________________________________________

Your email address: ____________________________________________________

Your phone number: ___________________________________________________

VWEA Member #: _______________________________________________________

MATH PROBLEM

Using the following information, calculate how we determined the source of the flow to be the correctional facility.

Municipal tank: Elevation at maximum (full) level – 655 ft.
Municipal tank: Elevation at minimum (bottom of bowl) level – 615 ft.
Municipal tank diameter – 59.0 ft.
Municipal tank drops 1.0 psi, every time the correctional facility tank fills.
Correctional facility tank fills 8 times every day (24 hrs.)
Metered water drawn into the correctional tank (28 days usage) – 5.0 MG
WWTP influent flow for same 28-day period – 10.1 MG

Please show work below and attach additional sheets as required.

*This 0.5 credit hour (cpe) course is provided as a FREE service to our joint WATER-OTTER.com and VWEA members by WATER-OTTER.com. Credit issued at no cost to VWEA Members and $15.00 for non-members. Payment can be by check and mailed with completed worksheet. For credit, simply complete this worksheet and mail it to Water Otter P. O. Box 36525, Richmond, VA 23225. Alternately, scan it and email it to admin@Water-Otter.com or fax it to 1-866-522-7927. The solution will be published in the Summer 2014 issue of The Conduit. A complementary 2.5 credit hour (cpe) wastewater operator math course will be offered at annual VWEA Operator meeting at Wintergreen in June 2014.
Imagine the result

Clean water. It’s not just our business. It’s our responsibility.

Too much water, or too little, or not enough water where it’s needed most – it’s a challenge to find the right balance of water to sustain life and the environment.

At ARCADIS, we know how to find the answers. We bring a comprehensive, results-driven approach to the complex water environment and help you manage water, pure and simple.

www.arcadis-us.com

Arlington, VA
Newport News, VA
Richmond, VA
Virginia Beach, VA
3rd Annual Wastewater Operations Education Conference & Operations Challenge Competition

June 11-13, 2014
Wintergreen
Route 664
Wintergreen, VA  22958

Mark your calendars for the 3rd Annual Wastewater Operations Education Conference and Operations Challenge Competition June 11-13th, 2014 at Wintergreen. This year’s conference will include something for everyone.

- The conference kicks off with a Golf Tournament on June 11th at Wintergreen’s Stoney Creek Golf Course.
- The Operations Challenge Competition follows on June 12th. It hardly ever breaks 75-degrees at the top of the mountain!
- Also offered on the 12th is a workshop worth 3.0 CEUs that is dedicated to the issues and management of FOG and High Strength Brewery Wastes, which features a tour of a local brewery. A shuttle will be provided to take participants in the workshop to and from the local brewery.
- On June 13, you can earn an additional 6.0 CEUs for participating in lectures associated with three Educational Tracks: Track A for Collection Systems, Track B for Basic Math and Relevant Topics, and Track C for Wastewater Treatment: Start to Finish.

Register online:
https://www.regonline.com/2014OpsEducationandOpsChallenge
Many military occupations are applicable to the water and wastewater industry. Veterans can bring this experience to your utility, but only if they know to apply for your jobs. The US EPA hosted a webinar on March 6, 2014 to review some of the military training and provide us the opportunity to seek out these experienced veterans.

The US EPA produced a guide titled, From M.O.S. to J-O-B, subtitled, A Guide for Applying Military Occupational Specialties (M.O.S.) to Civilian Drinking Water and Wastewater Operations. This short booklet helps you understand the occupation specialty training these men and women receive in the military, and helps you see how this training translates to your hiring of an experienced veteran.

MOSs (Army and Marines), also referred to as Ratings (Navy and Coast Guard) or Specialty Codes (Air Force), that are outlined in the Guide include Water Treatment Specialist, Utilitiesman, Water Support Technician, Damage Controlman, Machinery Technician, Marine Science Technician, and Water and Fuel Systems Maintenance. The guide covers a host of other MOSs that apply to Water Treatment Plant Operator, Pipe Fitter and Plumber apprenticeship programs, contracts and procurements, budgeting, administration, laboratory technicians, computer and network administrators, and other field and office jobs in our industry.

The guide also describes on-the-job and apprenticeship training programs which cover part of the veteran’s salary for a period of time, and a non-paid work experience program. The military will help our veterans train for your specific facility. The guide includes Internet links for further information. Links to the guide, the March 6, 2014 webinar, the webinar PowerPoint slides, and additional links can be found on the VWEA and the VA AWWA websites at http://www.vwea.org/committees/work-for-water or http://www.vaawwa.org/about-us/committees/18/work-for-water/.

This is an excellent opportunity for us to hire veterans and use the training they already received. The resources to reach out to them exist. We need only make use of the resources presented above.

If you are interested in joining the Virginia Work for Water Committee, contact the Committee Chair, Bob Forgione at bob.forgione@uosa.org. We are especially looking for HR specialists to join the committee, so do not be shy about approaching your HR department. Yes, they will need to join WEF/VWEA or AWWA/VA AWWA, and the rewards are great.
It seems as though inclement weather is becoming the norm for the annual Industrial Waste and Pretreatment Committee Workshop and Seminar. Once again, March roared in like a lion. However, in spite of the snow and cold temperatures, the IW&P Committee pulled off yet another successful event on March 3 and 4 at the Omni in Charlottesville. The 2014 event marked 30 years of committee workshop and seminar activity.

This year we went for a back-to-the-basics approach. The theme of Monday’s workshop was “Industrial Wastewater College: Fundamentals of Building and Maintaining a Pretreatment Program.” Speakers provided information on pretreatment program audits, inspections and annual reports, conducting industrial waste surveys, and development of local limits. I was particularly impressed with the attendee participation in roundtable discussion at the conclusion of Monday’s presentations. Tuesday’s seminar covered updates and developments in industrial wastewater management with presentations by representatives from EPA and DEQ, as well as case study information from industry representatives and their consultants.

A number of industries were recognized as recipients of the VWEA 2014 Industrial Waste & Pretreatment Award for Environmental Excellence. This award is presented to industrial users who are regulated under an approved pretreatment program or VPDES program who have achieved 100% compliance with their permit requirements and who have demonstrated dedication and commitment to pollution prevention, waste reduction or conservation through the implementation of an Environmental Management System.

There are three categories of awards: Silver – 100% compliance with pretreatment regulations for a full prior year; Gold – 100% compliance with pretreatment regulations for two to four consecutive years; and Platinum – 100% compliance with pretreatment regulations for five years.
or more onsecutive years. Those industries recognized this year were:

**Silver**
- Fareva Richmond Incorporated located in Henrico County
- Specialty Finishes, Incorporated located in the City of Richmond

**Gold**
- Coca-Cola Refreshments located in Henrico County
- Koppers Incorporated in Salem, and Handcraft Services, Incorporated in the City of Richmond

**Platinum**
- Afton Chemical Corporation, City of Richmond
- Pepsi Bottling Group LLC of Roanoke
- Covanta Alexandria/Arlington Incorporated of Alexandria
- Veterans Affairs Medical Center of Salem
- Covanta Fairfax Incorporated of Lorton

Congratulations to these industries for their successful efforts toward program compliance and program improvements!

I would like to take this opportunity to thank outgoing committee chair Jim Johnston for his leadership of the committee over the past two years and for his encouragement and guidance to me as I assume the role as committee chair for the coming year. I would also like to thank the committee membership and our technical vendor participants as well for a job well done. You are the people that make this event the success that it is. I look forward to working with you in the coming year.

Finally, if you are interested in participating in our committee activities, please contact me, Robert Graham, IW&P Chair at rgraham1@jetbroadband.com, or Kathy Rabalais, VWEA Administrator at www.vwea.org.

---

**Attention Treatment Plant Operators**

Let us pump your sludge. Then you be the judge.

Put our pump to the test. There’s no cost to you. Take the PVP Challenge and prove it to yourself.

We are so confident in our pumps’ ability to reduce your overall maintenance and labor costs that we will let you take one for a test drive... for FREE. You provide the application and we’ll provide the unit. It's that simple! PVP Double Disc®, Positive Displacement pumps feature:

- Seal-less, gland-less, oil-less design for zero routine maintenance.
- Will run dry indefinitely without damaging the pump.
- Passes solids up to 2 inches in diameter and full-line semi-solids.
- Fewer moving parts means less need for repairs or maintenance.
- Patented Maintain-in-Place design reduces downtime and lowers maintenance costs.

**The PVP Difference**

The repair of progressive cavity or rotary lobe-style pumps can be complex and costly. Our Double Disc® Pump system will operate up to 10 times longer in the same application and cost up to 70% less to repair when the need occurs.

**Swap Your Pump**

Install one of our pumps and put it to the test. There's no cost to you.

Represented by:

**FREE Pump Tryout**

Toll Free: 800-311-3311

PennValleyPump.com

Step 1-Suction Cycle.

Step 2-Discharge Cycle.

Phone: 804-560-5410
Fax: 804-560-5342
Email: sales@sherwoodlogan.com
WILL YOU BE READY FOR LOWER PHOSPHORUS LIMITS?

Discharge limits for phosphorus removal are more stringent than ever and pose a definite challenge for treatment plants. In most cases, the degree of removal required by a facility is determined by the quality of the receiving stream. Although a high degree of phosphorus removal can be achieved with a sophisticated secondary treatment process such as an AquaSBR® system or AquaPASS® system, some plants require even lower phosphorus levels. In this case, tertiary treatment is essential and lower levels can be achieved with an AquaDisk® or AquaDiamond® filter, AquaMB Process® or Aqua-Aerobic® MBR system.

**AquaSBR® Sequencing Batch Reactor**
- Enhanced nitrogen and phosphorus removal in a single unit process, eliminating the need for separate secondary clarifiers

**Aqua-Aerobic® MBR Membrane Bioreactor**
- Enhanced biological nutrient removal in a compact footprint and direct filtration via submerged membranes

**AquaPASS® Phased Activated Sludge System**
- Time-managed aerobic and anoxic reactions in a continuous-flow process schematic; nutrient removal is expedited via Phase Separator technology

**AquaMB Process® Multi-BARRIER Membrane System**
- High level nutrient removal utilizing multiple barriers, featuring cloth media filters followed by membranes

**AquaDisk®/AquaDiamond® Cloth Media Filters**
- OptiFiber® cloth filtration media provides advanced phosphorus removal
- Customized designs for retrofits and new plants

**IntelliPro® Monitoring and Control System**
- Combines process monitoring and integrated comparative analysis
- Automatic adjustment of biological nutrient removal and chemical addition
- Proactive operator guidance via the BioAlert™ process notification program

---

Kevin Ritchie
6209 Lansgate Road  |  Midlothian, VA 23112
p 804.928.8499  |  kevinrichie@comcast.net
Mowing Safety

By Beth Rosenthal

Lawn mowers and yard tractors are the primary workhorses of most grounds care operations. They also present a high potential for severe injury or even death to those who work with and around them. To prevent mowing tragedies, grounds care workers and managers must make safety a top priority when working with and around mowers and tractors.

Before mowing
All operators should read and follow the manufacturer’s operating instructions and safety advisories before operating any mowing equipment. Regular preventive maintenance on the equipment should be conducted beginning with checking the engine oil, radiator water and other lubricating fluids. Make sure that pulleys, drive belts and guards are in good condition and properly positioned. Worn belts and brakes, loose bolts, faulty wiring, improper tire pressure, and even broken seat belts can contribute to injury in the workplace. Make sure employees always disconnect wires or remove spark plugs when repairing or maintaining equipment. This practice will eliminate an accidental engine start.

Improperly used equipment is not only a danger to the operator but to others in the vicinity of the mowing operations. Guards and other safeguards must always be in place and properly positioned. Deflectors and guards on mower decks should remain in place when mowing near streets, parking lots and other places where flying objects thrown by the mower might damage property or people. Never override safety features.

Some manufacturers have equipped riding mowers with back-over protection devices, which prevent the blade from turning while the mower is in reverse. These back-over protection devices also might include a sensor that stops the engine or the blades or the wheels when it detects a bystander behind the machine. Check with equipment manufacturers to see if a back-over protection device can be installed on existing equipment.

Remove all defective equipment from operation immediately. Document any unsafe conditions and all corrective measures taken as a result of the inspection.

Employee training
Before anyone operates power equipment, especially mowing equipment, they must receive proper training. A rotary mower blade spins at 2,000-4,000 revolutions per minute (rpm), or 100-200 miles per hour (mph). It is imperative that mower operators know how to quickly disengage the clutch and stop the engine. Operators should know the location and function of all the controls.

A good training program should be a combination of hands-on instruction, classroom and operator feedback to assure personnel understand the proper operation of your equipment and your organization’s policies and procedures. Simply watching a video on groundskeeping or mower safety is not sufficient.

Training in equipment operation, however, is only one part of mower training. Operators also should be trained in safe maintenance of equipment. Instruction on how to properly and safely change blades and refuel the engine can be disastrous if done improperly.

Managers must make sure staff has adequate practice with the equipment they will be expected to use before heading to a job site. Inexperienced mower operators can cause injury to themselves and others but may also cause costly damage to the mower, landscaping or others’ property.

Continual training and regular safety reminders are essential to ensuring ongoing
safety awareness. Keeping safety on everyone’s mind throughout the year and, most importantly, during the busiest seasons will greatly reduce the potential for loss.

**Personal protection**

Mower operators should wear protective, close-fitting clothing – avoid loose or baggy clothing that can get caught in moving parts. Long pants and long sleeves will provide protection against UV rays as well as dust, debris, and insects that are stirred up from the grass. Provide reflective shirts or vests and hard hats to improve operator visibility especially when mowing along roads or in rights of way.

Sturdy footwear is a must. Steel-toed boots or shoes provide the most protection but a heavy work boot may suffice. Never allow workers to wear open-toed shoes, sandals or tennis shoes.

Operators should always wear safety glasses or goggles while mowing. Offering sunglasses with safety lenses may be essential during daytime mowing. A mower blade moving at speeds around 100 miles per hour can throw rocks, dust and mulch, which can cause temporary or permanent visual impairment.

All workers operating loud power equipment should wear ear protection. Continual exposure to loud noise, sound above 85 decibels for an eight-hour day, can cause hearing loss. New mowers and other power equipment are being engineered with noise reduction features but may not eliminate the need for hearing protection. If you find yourself working in a noisy environment regularly, contact your safety consultant to determine if a hearing conservation program is necessary.

Inspect the area to be mowed before mowing, looking for sticks, rocks and other debris that could become hazardous when hit and thrown from a mower.

"A mower blade moving at speeds around 100 miles per hour can throw rocks, dust and mulch, which can cause temporary or permanent visual impairment."

"The Conduit – Spring 2014"
The mower operator should survey the area to locate potholes or other hidden hazards before beginning. Mowing should be scheduled at times when people are not likely to be in the area of mowing. This can be particularly tricky for parks and recreational areas.

Mowing for long periods of time in the heat of the day can contribute to operator fatigue. Schedule regular water breaks and be mindful of heat related illness, which can be prevalent in the hottest months when mowing activity is usually at its peak. Heat-related illnesses can be minimized by instituting regular work/rest breaks and allowing operators to find a place to cool down and rehydrate.

**Fueling**
Observe safe fueling practices every time you fill a tank. Have a fire extinguisher readily available and know how to use it, should it be necessary. Never fuel a hot engine. Allow it to cool first. Use approved safety cans for dispensing of flammable liquids. These cans are equipped with spring-loaded lids and flame arrestors to prevent the spread of fire. Unapproved cans that are not full are more dangerous than full cans since the flammable vapor volume has been increased.

Always use a metal funnel when transferring fuel. It bonds the fuel container to the metal fuel spout on your equipment. Static electricity is created when pouring flammable liquids from one container to another. Bonding and grounding are needed to prevent sparks and static electricity from igniting flammable vapors. The hazard is reduced creating a ground connection between the fill container and the equipment.
"Always use a metal funnel when transferring fuel. Bonding and grounding are needed to prevent sparks and static electricity from igniting flammable vapors."

Mowing slopes
Slopes deserve special precautions. If at all possible, move up and down the slopes as opposed to horizontally. Follow the manufacturer’s designated maximum safe slope for the lawnmower being used. Instruct employees not to operate a riding mower across a slope that is greater than 10 degrees. Never mow on slopes when the grass is wet. Mowing slopes and berms might require special equipment.

Traffic
Avoid mowing medians and areas of vehicular traffic, except when the traffic volume is low. Parks should be targeted for times when visitor traffic is low. If anyone, including coworkers, comes near when mowing, stop mowing, or if necessary turn off the engine until they move a safe distance away from the mower.

Do not allow two mowers to work too close together. Make sure mowers can see each other at all times and are a safe distance apart in case one hits debris. Remember, a rock or wire can be thrown 100-200 feet or further, depending on the object and the mower.

Finally, make sure the operator selects the proper equipment for the size of job. A mower that is too large for an area can be dangerous for the operator and cause property damage.

After mowing
Clean the mower at the end of each shift. Perform routine maintenance on the equipment, using the manufacturer’s recommendations as a guide. Document and retain all maintenance and repair information on each piece of equipment.

Beth Rosenthal is the director of safety services for VML Insurance Programs (VMLIP). VMLIP is a nonprofit group self insurance program providing automobile, property, liability and workers’ compensation coverage to more than 460 local political subdivisions across Virginia. For more information visit: www.vmlins.org or follow VMLIP at: www.facebook.com/vmlip.
Jerry Peaks, PE, BCEE

Bowman Consulting

757.229.1776

www.smcprecastbuildings.com
Call 540.439.3266 for a FREE Quote or Catalog

SMC PRECAST BUILDINGS
FOR WATER & WASTE APPLICATIONS

PRE-ENGINEERED • STANDARD OR CUSTOM DESIGNS
Serving VA, MD, DE, DC, WV, NC

Installs in Hours, Lasts for Decades • Sizes 8’x12’ to 50’x250’
Minimal Site Prep • Outperforms Metal, Wood or Masonry
Resistant to: rot; rust; vandalism; fire; blast; windstorm

www.smcprecastbuildings.com
Pump Stations • Well Houses • Headworks • Maintenance
Belt Filter Press, Blower, Control, Operations Buildings
Methanol • Chemical Storage • HazMat • Restrooms & more

Envirep TLC
WATER & WASTEWATER EQUIPMENT SALES
Contact us for your equipment needs
Sykesville, MD
Phone: (717) 972-0851

Fallston, MD
Phone: (717) 972-0850

AERZEN
AMT
Enviro-Care
ETS
KRÜGER
GORMAN-RUPP
PUMPS

Custom Conveyor Corporation

Aqualitec
Screening Equipment
ABSTRACT
Biological processes continue to evolve toward better effluent quality in a smaller footprint. The fact that these processes are housed in a small footprint means that they have an inherent inability to store grit and debris. This, in conjunction with the trend towards reductions in plant personnel, drives the need for advanced headworks processes that are more effective at removing grit and debris. Screening, for example, has trended toward progressively smaller openings with 6 mm (1/4") screens commonly used. Smaller openings are required for certain biological processes, specifically Membrane Bio-Reactors for which some manufacturers require openings as small as 1 mm (0.040")\(^1\). This trend towards finer screening is also reflected in the increasing demand for improved grit removal processes as a part of plant design and upgrades.

Grit is a nuisance material that causes abrasive wear to mechanical equipment increasing maintenance and operational costs while reducing equipment performance and useful life. Grit that is not captured in the headworks accumulates in processes throughout the plant, reducing capacity and detention time, and adversely influencing flow and circulation patterns\(^2\). Deposited grit must be manually removed, handled, hauled and disposed. Abrasive wear, process inefficiencies, and basin cleaning operations increase treatment plant operating expenses.

Choosing a grit removal technology has often been based on equipment price with little regard for device efficacy and consequent grit removal efficiency. Owners and engineers are forced to navigate a field of, what can be conflicting, performance claims made by various equipment manufacturers. This situation is perpetuated by the fact that there is no accepted, peer reviewed test standard for grit sampling and analysis.

The purpose of this paper is to encapsulate various grit removal system performance data generated by a repeatable sampling and analysis methodology for the purpose of comparing virtually all grit removal technologies in terms of their effectiveness.

INTRODUCTION
Biological processes continue to evolve toward better effluent quality in a smaller footprint. The current trend of housing these processes and systems in smaller and smaller footprints imply an inherent inability to store grit and debris. Treatment plants now operate with reduced numbers of maintenance and operations staff, which in turn is resulting in significant reductions in the available resources and time to tackle and address the negative impacts of grit and debris.

Headworks screening and grit removal are the primary protection for all treatment processes and equipment in a wastewater treatment plant, yet it has been the most neglected part of the plant. To improve solids removal, screen openings on influent screens have trended progressively smaller over the past 10-15 years. Years ago, screen openings were frequently 25 mm (1") and larger. Today, screens are commonly supplied with 6 mm (¼") openings. It is logical that advancing grit removal processes, to effectively remove incoming grit, are becoming a higher priority in plant designs.

Selecting grit removal technologies can be a challenge due to the lack of comparative performance data available within the
wastewater industry. Owners and engineers are forced to navigate a field of, what can be conflicting, performance claims made by various equipment manufacturers. This situation is perpetuated by the fact that there is no accepted, peer-reviewed test standard for grit sampling and analysis.

As, there are no standard methods for the comprehensive measurement and analysis of sampled grit, most parties utilize conventional ASTM D-422 to obtain the physical particle size distribution of grit collected by various means. Standard Method 2540 for solids testing is used for determining total, fixed, and volatile solids. A method that engineers and owners have found effective, splits the sample with half being tested via ASTM D-422 and the other half being wet sieved and characterized based on settling velocity. In addition to physical size distribution, settling velocity is often the most important and useful criterion in grit system design.

Settling velocity is central to grit system design as technologies used to collect influent grit are predominantly sedimentation processes. Sedimentation basins and aerated grit basins (AGB) are recognized as gravity processes. Vortex processes using a forced vortex type flow regime also rely predominantly on gravity for separation. When the force balance on a particle is evaluated within a forced vortex type flow regime in a basin, gravity is shown to be the predominant force, well in excess of the centrifugal forces generated by slow rotational velocity.

While settling velocity is an important criterion in grit system design, the removal efficiency data presented in this paper is based on particle size distribution alone and does not consider settling velocity. Settling velocity is discussed elsewhere. As most performance guarantees are based on 2.65 specific gravity (SG) it is worth noting that observed performance can vary widely from performance claims. While some of the variance is certainly attributed to the SG of grit being less than 2.65 and other factors, wide variations from performance claims are likely influenced by other factors such as short-circuiting and/or inaccurate sizing.

METHODOLOGY

Effective test methodology must provide accurate, consistent, repeatable and reproducible results. One of several grit sampling methods used by owners and engineers is the vertical slot sampler (VSS). The VSS is designed to draw off a known vertical slice of the influent water column to provide an accurate sample of incoming solids. Although not detailed in ASTM manuals or Standard Methods, sampling using the VSS has been found to produce results that are repeatable, effective and allow efficiency comparisons at different treatment plants. Further, results determined with the VSS corroborates with the operating history and performance at those plants with respect to grit removal, suggesting the accuracy of the test method. This same test methodology can be used for comparison of grit removal efficiency of various technologies.

The VSS methodology used in the referenced studies provides a repeatable sampling and analysis methodology that allows for the relative comparison of removal efficiency for different devices. The test methodology typically includes a margin of error of +/- 5% and is described elsewhere. Data collected and presented herein has been made available in various industry publications and reports as cited. Hampton Roads Sanitation District (HRSD) performed comprehensive testing at five of their wastewater treatment plants in 2007 and 2008 utilizing the VSS sampling method. The equipment tested included three different mechanically induced vortex systems (MIV), a Detritor system and an aerated grit system (AGB). During the same period, HRSD conducted a side-by-side pilot test comparing the stacked tray Eutek Head-Cell® unit and the structured flow Grit King® unit. Both systems were tested for removal efficiency using the VSS sampling method.

Data collected on the HRSD AGB has been excluded from this paper. During the above referenced testing, which was performed on dry weather flows, it was determined that the grit was settling in the force main as there was not sufficient energy in the collection system to transport grit to the plant. At peak diurnal flows the velocity in the force main was 0.5 m/s (1.7 fps), when 0.9-1.5 m/s (3.5-5.0 fps) is needed to re-suspend settled solids and grit. Therefore, data...
from testing on the AGB was inconclusive. However, the same collection and analysis methodology was used in Columbus GA on an AGB, that data is included in this paper.

This paper provides removal efficiency, utilizing identical and consistent sampling and analysis methodology, of virtually every type of grit removal technology, thus allowing comparison of removal efficiency of these technologies. The processes represented include AGB, vortex grit removal systems, and detritus tanks. The vortex units include mechanically induced vortex (MIV) units, stacked tray units and structured flow vortex units.

RESULTS
Mechanically Induced Vortex (MIV) Units

HRSD Chesapeake-Elizabeth Treatment Plant

The Chesapeake Elizabeth Treatment Plant (CETP) is a 91 ML/d (24 MGD) capacity plant operating with an average flow of approximately 72 ML/d (19 MGD). Grit removal equipment consists of two (2) 7.3 m (24’) diameter MIV units, one unit was in operation during the study. Design removal parameter for each unit is 95% removal of 150 µm particles, 2.65 SG, at 114 ML/d (30 MGD), and 95% removal of 270 µm particles, 2.65 SG, at 265 ML/d

<table>
<thead>
<tr>
<th>Test apparatus – continuous collector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test apparatus – wet sieve</td>
</tr>
<tr>
<td>Test apparatus – modified Imhoff cone</td>
</tr>
<tr>
<td>Test apparatus – vertical slot sampler (VSS)</td>
</tr>
</tbody>
</table>

Table #1 Removal Efficiency of MIV

<table>
<thead>
<tr>
<th>% Removal Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>CETP #50 Mesh (&gt;297 microns)</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Thu. May 17, 2007</td>
</tr>
<tr>
<td>Fri. May 18, 2007</td>
</tr>
</tbody>
</table>

Table #2 Removal Efficiency of MIV

<table>
<thead>
<tr>
<th>% Removal Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIP #50 Mesh (&gt;297 microns)</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Sun. May 20, 2007</td>
</tr>
<tr>
<td>Mon. May 21, 2007</td>
</tr>
<tr>
<td>Tue. May 22, 2007</td>
</tr>
</tbody>
</table>
(70 MGD). Average flow during testing was 71.1 ML/d (18.79 MGD), which is well below the rated capacity of the grit unit. The observed removal efficiency was 48-52% of all grit 150 µm and larger and 45-50% of all grit 106 micron and larger. Removal efficiency of particles > 297 microns, a slightly larger particle than the performance claim, was 72-78% or roughly 20% less than the claimed removal.

HRSD Virginia Initiative Plant

The Virginia Initiative Plant (VIP) is a 151 ML/d (40 MGD) capacity plant with an average flow of approximately 110 ML/d (29 MGD). The plant employs three 6.1 m (20 ft) diameter MIV units, one unit was in operation during the study. The vortex manufacturer states that each unit will remove 65% of 150 µm grit, 2.0 SG, at 101 ML/d (26.7 MGD). Average flow during three days of testing was 99.2 ML/d (26.23 MGD), very near the rated capacity of the grit units. The observed removal efficiency was 43-45% of all grit 150 µm and larger, 20% below the claimed efficiency, and 43-44% of all grit 106 micron and larger.

Detritus Tank

HRSD James River Treatment Plant History

The testing at HRSD included testing at the James River Treatment Plant (JRTP) which operates detritus tanks for grit removal. The JRTP is a 76 ML/d (20 MGD) capacity plant with an average flow of approximately 49 ML/d (13 MGD). The JRTP employs four detritors. Each detritor is 8.5m (28') diameter with a design capacity of 24.6 ML/d (6.5 MGD). Each unit is designed to remove grit particles 150 µm and larger, with 2.65 SG. Average flow to the plant during three days of testing was 48.75 ML/d (12.88 MGD) with one of the detritor units out of service; therefore each unit was processing approximately 16.27 ML/d (4.3 MGD) or roughly 33% below their rated capacity. The observed removal efficiency was 66-73% of all grit 150 µm and larger and 57-68% of all grit 106 micron and larger.

Aerated Grit Basin

Columbus GA South Water Reclamation Facility

The City of Columbus, GA South Water Reclamation Facility (SWRC) operates four AGB units that receive a combined average daily flow of approximately 106 ML/d (28.0 MGD). A rain event occurred on January 28, 2008 resulting in an increase in the flow to 143.84 ML/d (38 MGD) with a maximum hourly flow of 185.5 ML/d (49 MGD). As can be seen from the results below, when the flow to the grit chamber increased the removal efficiency decreased, as would be expected.

The plant has two AGB that are 5.18m x 11.89m (17' x 39') and two basins 3.96m x 10.97m (13' x 36'). While no design removal efficiency data exists, total surface area available for grit settling is 210 m² (2,262 ft²). Based on the average flow of 106 ML/d (28.0 MGD), the AGB system has a surface-loading rate (SLR) of 0.35 m³/min./m² (8.6 gpm/ft²) and would be expected to remove a significant percentage of fine particles, 106 micron and below. The plant notices a decrease in removal efficiency at flows in excess of 132.5 ML/d (35 MGD). Once the flow reaches 132.5 ML/d (35 MGD) the SLR increases to 0.435 m³/min./m² (10.7 gpm/ft²). Based on SLR alone the basin would still be expected to retain a percentage of fine particles at 132.5 ML/d (35 MGD) with particle size retained increasing, and overall capture efficiency decreasing, as flow continues to rise.

<table>
<thead>
<tr>
<th>% Removal Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>#50 Mesh (&gt;297 microns)</td>
</tr>
<tr>
<td>JRTP</td>
</tr>
<tr>
<td>Sun. Jun 17, 2007</td>
</tr>
<tr>
<td>Mon. Jun 18, 2007</td>
</tr>
<tr>
<td>Tue. Jun 19, 2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Removal Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>#50 Mesh (&gt;297 microns)</td>
</tr>
<tr>
<td>Columbus</td>
</tr>
<tr>
<td>Jan 28, 2008</td>
</tr>
<tr>
<td>Jan 29, 2009</td>
</tr>
</tbody>
</table>
The observed removal efficiency was 35-70% of all grit 150 µm and larger and 32-67% of all grit 106 micron and larger when the wet weather data is included. Removal efficiency improves to 58-70% of all grit 150 µm and larger and 53-67% of all grit 106 micron and larger during average flow of 106 ML/d (28.0 MGD). While excluding the performance during the wet weather event indicates improved performance, removal efficiency is well below what would be expected based solely on SLR.

**Stacked Tray System**
While considering a new grit system for their Army Base Treatment Plant (ABTP), HRSD tested two grit removal technologies side-by-side in December of 2007. The stacked tray Eutek HeadCell® unit was tested side-by-side a Grit King® structured flow unit using the same sampling and testing methodology. During the pilot test the stacked tray HeadCell unit was fed at 38.6-38.8 m³/hr (170-171 gpm). At that flow rate the Stacked Tray unit was designed to remove 95% of all grit 75 micron and larger, with 2.65 SG, however, performance was not tested for 75 micron particles. The observed removal efficiency was 92-93% of all grit 150 µm and larger and 89-90% of all grit 106 micron and larger.

“...the low removal efficiency suggests the importance of considering the likely effects of grit settling velocity and other criteria.”

**Structured Flow System**
During the side-by-side testing the 1.2 m (4’) diameter structured flow Grit King pilot unit was fed at a rate of 38.8 m³/hr (170 gpm) on December 17th and 25.4 m³/hr (112 gpm) on December 19. Design removal parameter at the higher flow is 95% of all grit 106 micron and larger, 2.65 SG. At the lower flow of 25.4 m³/hr (112 gpm) the removal would be expected to be 95% of all grit 75 micron and larger; 2.65 SG, however removal efficiency for 75 micron particles was not reported. As would be expected, the removal efficiency improves at the lower flow rate as loading rate to the unit is reduced. The observed removal efficiency was 90-95% of all grit 150 µm and larger and 87-93% of all grit 106 micron and larger.

**DISCUSSION**
As can be seen from the above data, testing results for the mechanically induced vortex technology were considerably below the manufacturers’ claimed removal efficiency even when running the unit well below design flows. The testing results indicate this technology had its highest observed removal efficiencies for large grit particles, approximately 60%+ removal of particles larger than 297 micron, and very low performance removing smaller particles, with less than 30% removal of particles 210 micron and smaller.

At CETP the MIV was designed to remove 95% of grit 150 micron and larger, with 2.65 SG at a flow of 114 ML/d (30 MGD). When operating at 63% of the design flow (71.1 ML/d (18.79 MGD), the observed removal efficiency of grit particles 150 microns and larger was 48-52%, which is more than 40% less than the stated claim. The 7.3 m (24’) diameter MIV unit has a surface area of 41.83 m² (452 ft²), which results in an estimated SLR of 1.18 m³/min./m² (28.97 gpm/ft²) at 71.1 ML/d (18.79 MGD). Based on the SLR the MIV technology would, in theory, be expected to retain a large percentage of particles approximately 165 micron and larger. The observed removal efficiency for much larger particles, 297 microns and larger, was only 72-78%. The low removal efficiency suggests the importance of considering the likely effects of grit settling velocity and other criteria.

Based on operational data from VIP it was found that placing more vortex units into service improved grit removal. During 2007 the plant averaged 99 ML/d (26.2 MGD) and used one vortex unit 83% of the year. For 2008, two vortex units were in service for 75% of the year and grit production increased 50% over 2007 performance. HRSD determined...
that operating a vortex close to the maximum rated hydraulic efficiency may not be advisable for some treatment plants. Further, they concluded that with this technology placing additional grit removal units in service during high hydraulic events can minimize the impacts of grit slug loads on downstream unit processes.

While test data indicates the Detritus tank achieves higher removal efficiency than the MIV technology, the Detritus tank also fell short of design removal efficiency while operating at 66% of design flow. Test data shows relatively high removal efficiencies of large grit particles, 77%+ removal of particles larger than 297 micron and, as would be expected, reduced capability of removing smaller particles, 64%+ removal of particles 210 micron and smaller. Although an older style technology, sampling and analysis for the detritus tank displayed some of the higher removal efficiencies of the technologies tested. Removal efficiency would be expected to decline at peak design flow.

The AGB results were comparable to those for the Detritus tank during the plant average flow, 58-67% of all grit 106 microns and larger was removed. During wet weather when the system received the design flow rate, removal efficiency was reduced to 32.5%. Even considering the small increase in flow during the rain event, which was in the region of 135-175% of average, the quantity of grit increased substantially from 3.36 g/m² (28.1 lbs./MG) to 8.89 g/m² (74.2 lbs./MG). The fraction of grit smaller than 297-microns also increased significantly. The increased grit quantity and elevated fraction of small grit resulted in the observed poor removal efficiencies. A reduction in removal efficiency at higher flows is expected, however, during the elevated flow, influent grit concentration also increased by a factor of more than 2.5 times the prior day dry weather influent levels. A removal efficiency of 32-35% of the heavier grit load will obviously not be adequate to protect the plant from deposition and abrasive wear.

The stacked tray system and structured flow unit test results exhibited very high removal rates. While the performance results for these two technologies were performed as a pilot study they are consistent with full scale performance tests, using the identical test method, at other facilities8,9. Measured removal efficiency for both technologies was slightly below manufacturers claimed removal efficiencies, within +/- 8%. This small deviation is very near the margin of error in testing. Comparatively, these two technologies provide very high removal efficiencies of large grit particles, 93%+ removal of particles larger than 300 micron.

CONCLUSIONS
Grit sampling using the VSS method produces results that are repeatable, accurate and effective. The results corroborate with grit system performance and plant operating history therefore this data provides insight into what most operators’ experience. Using this common testing method allows comparison of performance of various grit removal technologies and can assist in improving grit system design and justifying advanced processes.

Based on the reported and referenced testing, the technologies that displayed the lowest removal efficiencies were the AGB and the MIV technology. The observed removal efficiency for both technologies was well below claimed removal at peak flows. The AGB displayed a relative removal of only 32% of all grit 106 micron and larger when operated at peak design flow. Results for the AGB improve to 53-67% when influent flow to the unit is reduced to 66% of design.

The MIV technology removed 43-51% of incoming grit 106 micron and larger when operated at 27-90% of design flows. As is true of all SLR based technologies, the MIV

### Table #7 Relative Performance of Grit Removal Devices

<table>
<thead>
<tr>
<th>Technology</th>
<th>% of Design Flow</th>
<th>Design Removal Efficiency at 100% Flow</th>
<th>Observed Total % Removal 150 µm and up</th>
<th>Observed Total % Removal 106 µm and up</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIV</td>
<td>27-90</td>
<td>95% removal of 270 µm, 2.65 SG</td>
<td>43-52</td>
<td>43-50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65% removal of 150 µm, 2.0 SG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detritus Tank</td>
<td>66</td>
<td>150 µm and larger, 2.65 SG</td>
<td>66-71</td>
<td>57-68</td>
</tr>
<tr>
<td>AGB</td>
<td>66-100</td>
<td>Unknown</td>
<td>35-70</td>
<td>32-67</td>
</tr>
<tr>
<td>Stacked Tray</td>
<td>100</td>
<td>95% removal of 75 µm, 2.65 SG</td>
<td>91-92.5</td>
<td>89-90</td>
</tr>
<tr>
<td>Structured Flow</td>
<td>66-100</td>
<td>95% removal of 106 µm, 2.65 SG</td>
<td>90-95</td>
<td>87-93</td>
</tr>
</tbody>
</table>
technology shows higher removal efficiencies at lower flows. When operating near design flow rate, removal efficiency was in the 43-45% range for all grit 106 micron and larger. As flows decrease, to 63% of average flow and 12% of peak flow, the efficiency increases, but only marginally, to 45-50% removal of grit 106 micron and larger.

The detritus tank displayed a higher removal rate, removing 57-69% of all grit 106 micron and larger when operating at average flows, in the region of 66% of peak design flow. The AGB displayed similar results when operated at 66% of peak flow. When flows increased to peak, the AGB removal efficiency dropped to 32% and the detritus tanks would be expected to have similar results as flows increase.

The structured flow vortex and stacked tray vortex units had very high removal rates, none lower than 87.5% of incoming grit 106 micron and larger. These results are significantly (20% to 55%) higher than any of the other technologies tested. Over the life of the facility, the difference in captured grit is substantial. Also of note, is the fact that high removal results were achieved with the equipment running at peak design flow. None of the technologies tested met their performance claim exactly, although the technologies that targeted the finest particles displayed the best results and came closest to achieving their performance claim.

Systems designed for high removal efficiency of small particles, 106 micron and finer, should remove 85% or more of grit entering the plant.

"The observed decrease in performance with increased flows provides strong evidence that the tested technologies are strongly influenced by loading rate and gravity to capture and retain grit."

The observed decrease in performance with increased flows provides strong evidence that the tested technologies are strongly influenced by loading rate and gravity to capture and retain grit. A better understanding of in situ grit settling velocity will allow for more efficient design which would afford the plant increased protection from abrasive wear and deposition.

Wet weather is an important consideration in grit system design. The impact of wet weather flows was documented during testing of the ABG in Columbus, GA. Considering the small increase in flow during the rain event, 135-160% of average, the quantity of grit increased much more dramatically, to more than 2.5 times the volume entering the plant during the prior day average flow. One would expect the greatest increase would be of coarse grit particles but the overall gradation was finer. Grit quantities increased across all size ranges but the grit fraction larger than 297 micron decreased, from 61.7% to 39.0%, while particles in the 105-210 micron range increased from 20.6% to 39.7% of the total. Overall, a 60% increase in flow resulted in a 48% decrease in performance.
Significant increase in grit volumes during wet weather events is a common phenomenon\(^{10}\) and indicates the need to design the grit system for effective removal at peak hydraulic loadings. The AGB and MIV performed poorly at peak design flow and based on the data the detritus tank would be expected to perform similarly to the AGB. Observed removal efficiencies were less than what would be expected based on SLR alone indicating process inefficiencies or grit settling velocity implications.

Designing the grit removal system for high removal efficiency at peak hydraulic loading will protect the plant from the negative impacts of grit. Advanced, compact, high-efficiency grit removal processes are therefore the more appropriate proven choice to protect plants from deposition, abrasive wear and associated costs from this nuisance material.

**ACKNOWLEDGEMENTS**

The authors would like to thank Mr. Cliff Arnett, Senior Vice President, Columbus Water Works and Mr. Mike Taylor, Superintendent, Columbus Water Works, South Columbus Water Resources Facility for permission to use data from their testing and providing the additional information needed to compile the comparisons.

**REFERENCES**

1. Cote, Brink and Adnan (2006) Pretreatment Requirements for Membrane Bioreactors. WEFTEC


At Brown and Caldwell, we connect the tried-and-true with the best new ideas to deliver innovative treatment solutions that enhance our communities. Full service delivery. That’s essential. That’s Brown and Caldwell.
The VWEA/VA AWWA Joint Laboratory Practices Committee (LPC) is proud to announce that the 20th Annual Good Laboratory Practices Conference will be held at the Omni in Charlottesville on July 28 and 29 this year. The event will consist of several half-day workshops on July 28 with topics on microbiology, basic laboratory skills, using demonstration of capability quality control and proficiency testing for quality improvement and laboratory audit findings and accepted corrective action taken. Technical programs will be presented on July 29 with topics including the following:

- Drinking water regulatory affairs
- Control charting and trending
- Microbiology PT
- Safe laboratory practices and procedures
- Slicing and dicing UCMR3 results
- Where to start when writing an SOP
- Streamlining laboratory weekend operations
- Automated methods for MBAS

There will be an exhibitors’ reception on the evening of July 28 with the latest in instrumentation and equipment on display. The LPC also plans to present a workshop at this year’s WaterJAM in Hampton on September 8. The theme is “Managers, OMG Are You Prepared for Tomorrow?”

This is an excellent opportunity to meet and network with fellow professionals from all over Virginia, and earn CPEs for wastewater and water operators and CECs. Information regarding these worthwhile events, as well as contact information, will be posted on the VWEA and VA AWWA websites. So mark your calendars, and be on the lookout for more information to come!

The LPC membership is represented by a variety of municipal wastewater and drinking water laboratories, commercial laboratories, as well as regulatory agencies and laboratory vendors. Meetings are held throughout the year to discuss such interesting topics as laboratory issues, changing methodologies, regulatory concerns, and quality assurance requirements.

The LPC meetings for 2014 are scheduled as follows: April 23, June 18 and October 22. Meetings are held at the Henrico Water Reclamation Facility with subcommittee meetings starting at 10am and full committee meeting at 11:00 a.m. There is a short technical presentation with lunch provided. We encourage everyone interested to join and participate, and take advantage of the wealth of knowledge and experience that is there.
VWEA Golf Tournament

June 11, 2014
Stoney Creek Golf Course
Wintergreen, VA

2 Person Teams - Best Ball (Captain's Choice)
$75.00/person (includes lunch)

Register online: https://www.regonline.com/golfwintergreen
CVRAC Annual Golf Tournament

Thursday, July 17, 2014
Hunting Hawk Golf Club in Richmond

SAVE THE DATE!

STAY TUNED FOR EVENT DETAILS!
The Collection Systems Committee is continuing to work on a variety of activities to support and recognize the contributions of our industries’ collection system professionals. In recent months, our committee actively assisted the WaterJAM Committee with abstract reviews in the Collection Systems tracks, and is providing a presentation at the May 1 Education Committee Seminar on collection system automation. Later in June 2014, our committee has joined with the Operations Conference in Wintergreen to offer a complete track of collection systems topics geared for the operators, including safety, pump operations, interpreting engineering drawings, flow monitoring, and condition assessment.

We are currently developing a new award for WVEA that focuses on Collection System performance. The new awards will be called the “Collection System of the Year” award. Soon we will be soliciting nominations for the Golden Manhole Award which recognizes contributions made in our association for Collection Systems. Finally, we are starting preparation for a fall seminar with the hope that it can surpass the success we had in last year’s seminar on Private Property I/I Abatement. If you would like to join our committee to help out in any of these activities, please contact the committee chair, Chris Wilson, at cwilson@brwncafd.com.
To reach wastewater professionals through The Conduit magazine and its targeted readership, contact Dave at your earliest convenience to discuss your company’s promotional plans for 2014.

Dave Gill, Marketing Manager
Toll Free: 866-985-9791
E-mail: david@kelman.ca
The Conduit would not be possible without the advertising support of these companies and organizations. Please think of them when you require a product or service. We have endeavoured to make it easier for you to contact these suppliers by including their telephone numbers and, where applicable, their websites.

<table>
<thead>
<tr>
<th>Company</th>
<th>Page</th>
<th>Telephone</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqua-Aerobic Systems, Inc.</td>
<td>42</td>
<td>815-654-2501</td>
<td><a href="http://www.aqua-aerobic.com">www.aqua-aerobic.com</a></td>
</tr>
<tr>
<td>ARCADIS U.S., Inc.</td>
<td>37</td>
<td>804-740-0181</td>
<td><a href="http://www.arcadis-us.com">www.arcadis-us.com</a></td>
</tr>
<tr>
<td>Atkins North America, Inc.</td>
<td>57</td>
<td>800-477-7275</td>
<td><a href="http://www.atkinsglobal.com">www.atkinsglobal.com</a></td>
</tr>
<tr>
<td>BDP Industries, Inc.</td>
<td>55</td>
<td>518-527-5417</td>
<td><a href="http://www.bdpindustries.com">www.bdpindustries.com</a></td>
</tr>
<tr>
<td>Black &amp; Veatch</td>
<td>16</td>
<td>703-243-0938</td>
<td><a href="http://www.bv.com">www.bv.com</a></td>
</tr>
<tr>
<td>Bowman Consulting</td>
<td>47</td>
<td>757-229-1776</td>
<td><a href="http://www.bowmanconsulting.com">www.bowmanconsulting.com</a></td>
</tr>
<tr>
<td>Brown and Caldwell</td>
<td>56</td>
<td>757-518-2400</td>
<td><a href="http://www.brownandcaldwell.com">www.brownandcaldwell.com</a></td>
</tr>
<tr>
<td>CDM Smith</td>
<td>45</td>
<td>757-873-8850</td>
<td><a href="http://www.cdmsmith.com">www.cdmsmith.com</a></td>
</tr>
<tr>
<td>CEI Carbon Enterprises, Inc.</td>
<td>57</td>
<td>800-344-5770</td>
<td><a href="http://www.ceifiltration.com">www.ceifiltration.com</a></td>
</tr>
<tr>
<td>CH2M HILL</td>
<td>3</td>
<td>703-376-5000</td>
<td><a href="http://www.ch2mhill.com">www.ch2mhill.com</a></td>
</tr>
<tr>
<td>Chempace Corp.</td>
<td>37</td>
<td>800-423-5350</td>
<td><a href="http://www.chempace.com">www.chempace.com</a></td>
</tr>
<tr>
<td>ClearWater, Inc.</td>
<td>32.33</td>
<td>828-855-3182</td>
<td><a href="http://www.clearwaterinc.net">www.clearwaterinc.net</a></td>
</tr>
<tr>
<td>Coyne Environmental Services</td>
<td>12</td>
<td>215-785-3000</td>
<td><a href="http://www.coyneenvironmental.com">www.coyneenvironmental.com</a></td>
</tr>
<tr>
<td>Crowder Construction Company</td>
<td>20</td>
<td>800-849-2966</td>
<td><a href="http://www.crowdercc.com">www.crowdercc.com</a></td>
</tr>
<tr>
<td>Delta Systems Environmental</td>
<td>26</td>
<td>757-286-7182</td>
<td><a href="http://www.dselc.com">www.dselc.com</a></td>
</tr>
<tr>
<td>Draper Aden Associates</td>
<td>46</td>
<td>540-552-0444</td>
<td><a href="http://www.daa.com">www.daa.com</a></td>
</tr>
<tr>
<td>EJ</td>
<td>16</td>
<td>800-626-4653</td>
<td><a href="http://www.ejco.com">www.ejco.com</a></td>
</tr>
<tr>
<td>Envirep/TLC</td>
<td>47</td>
<td>717-761-7884</td>
<td><a href="http://www.envirep.com">www.envirep.com</a></td>
</tr>
<tr>
<td>Evoqua Water Technologies</td>
<td>19</td>
<td></td>
<td><a href="http://www.evoqua.com">www.evoqua.com</a></td>
</tr>
<tr>
<td>Ford Hall Company</td>
<td>61</td>
<td>859-624-7077</td>
<td><a href="http://www.fordhall.com">www.fordhall.com</a></td>
</tr>
<tr>
<td>Gannett Fleming, Inc.</td>
<td>61</td>
<td>703-222-3704</td>
<td><a href="http://www.gannettfleming.com">www.gannettfleming.com</a></td>
</tr>
<tr>
<td>Garney Construction</td>
<td>30</td>
<td>816-741-4600</td>
<td><a href="http://www.garney.com">www.garney.com</a></td>
</tr>
<tr>
<td>Greeley and Hansen</td>
<td>37</td>
<td>804-355-9993</td>
<td><a href="http://www.greeley-hansen.com">www.greeley-hansen.com</a></td>
</tr>
<tr>
<td>Hatch Mott MacDonald</td>
<td>61</td>
<td>571-451-0950</td>
<td><a href="http://www.hatchmott.com">www.hatchmott.com</a></td>
</tr>
<tr>
<td>Hazen and Sawyer</td>
<td>15</td>
<td>757-222-1500</td>
<td><a href="http://www.hdrinc.com">www.hdrinc.com</a></td>
</tr>
<tr>
<td>Heyward Incorporated</td>
<td>1BC</td>
<td>804-965-0086</td>
<td><a href="http://www.heywardinc.com">www.heywardinc.com</a></td>
</tr>
<tr>
<td>Huber Technology Inc.</td>
<td>9</td>
<td>704-990-2055</td>
<td><a href="http://www.huber-technology.com">www.huber-technology.com</a></td>
</tr>
<tr>
<td>Hydro International</td>
<td>21</td>
<td>866-615-8130</td>
<td><a href="http://www.hydro-int.com">www.hydro-int.com</a></td>
</tr>
<tr>
<td>Infilco Degremont</td>
<td>14</td>
<td>804-756-7600</td>
<td><a href="http://www.degremont-technologies.com">www.degremont-technologies.com</a></td>
</tr>
<tr>
<td>Johnson, Mirmiran &amp; Thompson</td>
<td>60</td>
<td>757-499-1895</td>
<td><a href="http://www.jmt.com">www.jmt.com</a></td>
</tr>
<tr>
<td>Kemira</td>
<td>22</td>
<td>800-879-6353</td>
<td><a href="http://www.kemira.com">www.kemira.com</a></td>
</tr>
<tr>
<td>LimnoTech</td>
<td>46</td>
<td>202-833-9140</td>
<td><a href="http://www.limno.com">www.limno.com</a></td>
</tr>
<tr>
<td>Michael Baker Jr., Inc.</td>
<td>61</td>
<td>757-631-5442</td>
<td><a href="http://www.mbakerintl.com">www.mbakerintl.com</a></td>
</tr>
<tr>
<td>Mid Atlantic Storage Systems, Inc.</td>
<td>61</td>
<td>740-335-2019</td>
<td><a href="http://www.midatlanticstorage.com">www.midatlanticstorage.com</a></td>
</tr>
<tr>
<td>Oldcastle Precast</td>
<td>4</td>
<td>888-966-3227</td>
<td><a href="http://www.oldcastleprecast.com/stormcapture">www.oldcastleprecast.com/stormcapture</a></td>
</tr>
<tr>
<td>Parsons</td>
<td>31</td>
<td>703-934-2300</td>
<td><a href="http://www.parsons.com">www.parsons.com</a></td>
</tr>
<tr>
<td>Penn Valley Pump Company, Inc.</td>
<td>41</td>
<td>215-343-8750</td>
<td><a href="http://www.pennvalleypump.com">www.pennvalleypump.com</a></td>
</tr>
<tr>
<td>Pittsburg Tank &amp; Tower Maintenance Co., Inc.</td>
<td>28</td>
<td>270-826-9000</td>
<td><a href="http://www.watertank.com">www.watertank.com</a></td>
</tr>
<tr>
<td>Pollardwater.com</td>
<td>23</td>
<td>800-437-1146</td>
<td><a href="http://www.pollardwater.com">www.pollardwater.com</a></td>
</tr>
<tr>
<td>Red Engineering Company, Inc.</td>
<td>29</td>
<td>540-371-8500</td>
<td><a href="http://www.reidengineering.com">www.reidengineering.com</a></td>
</tr>
<tr>
<td>Research Environmental &amp; Industrial Consultants, Inc.</td>
<td>34</td>
<td>800-999-0105</td>
<td><a href="http://www.reiclabs.com">www.reiclabs.com</a></td>
</tr>
<tr>
<td>RK&amp;K</td>
<td>25</td>
<td>800-787-3755</td>
<td><a href="http://www.rkk.com">www.rkk.com</a></td>
</tr>
<tr>
<td>Sherwood-Logan &amp; Associates</td>
<td>OBC</td>
<td>804-560-5410</td>
<td><a href="http://www.sherwoodlogan.com">www.sherwoodlogan.com</a></td>
</tr>
<tr>
<td>Smith &amp; Loveless Inc.</td>
<td>16</td>
<td>913-888-5201</td>
<td><a href="http://www.smithandloveless.com">www.smithandloveless.com</a></td>
</tr>
<tr>
<td>SpectraShield Liner Systems</td>
<td>60</td>
<td>800-422-7266</td>
<td><a href="http://www.spectrashield.com">www.spectrashield.com</a></td>
</tr>
<tr>
<td>Tencarva Machinery Company</td>
<td>61</td>
<td>336-665-1435</td>
<td><a href="http://www.tencarva.com">www.tencarva.com</a></td>
</tr>
<tr>
<td>Timmons Group</td>
<td>45</td>
<td>804-200-6359</td>
<td><a href="http://www.timmons.com">www.timmons.com</a></td>
</tr>
<tr>
<td>Varec Biogas</td>
<td>24</td>
<td>714-220-9923</td>
<td><a href="http://www.varec-biogas.com">www.varec-biogas.com</a></td>
</tr>
<tr>
<td>Wendel</td>
<td>28</td>
<td>703-299-8718</td>
<td><a href="http://www.wendelcompanies.com">www.wendelcompanies.com</a></td>
</tr>
<tr>
<td>Whitman, Requardt &amp; Associates, LLP</td>
<td>44</td>
<td>804-272-8700</td>
<td><a href="http://www.wreallp.com">www.wreallp.com</a></td>
</tr>
<tr>
<td>WileyWilson</td>
<td>27</td>
<td>434-947-1901</td>
<td><a href="http://www.wileywilson.com">www.wileywilson.com</a></td>
</tr>
<tr>
<td>Winschel Environmental</td>
<td>6.7</td>
<td>804-545-3115</td>
<td><a href="http://www.winev.com">www.winev.com</a></td>
</tr>
</tbody>
</table>
Representing leading process equipment manufacturers with state of the art technologies for the water and wastewater industry

WWW.SHERWOODLOGAN.COM
MD. Annapolis (410)841-6810
VA. Richmond (804)560-5410
PA. Philadelphia (215)702-1402