

FALL
2015

The Official Publication of the Water Environment Association of Utah



DIGESTED news

Celebrating 50 Years of Clean Water



WEAU Jordan River CLEANUP

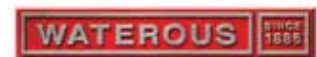
INSIDE:

Granular Activated Sludge Technology ■ 2015 WEAU Mid-Year Conference ■ WEF News

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Phil Heck, Ph.D., P.E.

Infrastructure Asset Management (AM) – Can you afford to not do it?

Last October, Central Valley Water Reclamation Facility (CVWRF) experienced the collapse of one barrel of a 2,300 ft. long, 30-inch diameter inverted siphon. This component of a key interceptor line transports approximately 12 mgd of wastewater from Granger-Hunter Improvement District (GHID) east under the Jordan River to the CVWRF treatment plant. The collapse resulted in a sinkhole approximately 15 ft. deep, 25 ft. wide and 50 ft. long. Luckily, no one was injured; damage to outside parties was limited to loss of landscaping, trees and portions of an apartment complex parking lot; and flow could be diverted to a second siphon barrel thus avoiding a sanitary sewer overflow.

The collapse was a big surprise since this pipe was not old by infrastructure design-life standards (installed in the early 1980's); constructed of high quality mortar-lined ductile iron pipe; and thought to be fully submerged thus eliminating exposure to corrosive hydrogen sulfide gas. It turned out this last assumption was not true. The pipe

section that collapsed, as well as a downstream section that was severely corroded along the pipe crown were not always flooded but were exposed to corrosive gasses. This exposure occurred during low flow conditions when the pipe was only partially full and as a result of entrained bubbles coalescing and forming a large gas pocket along the crown of the pipe. The gas pocket was trapped from moving through the pipe by the sharp downward slope as the pipe dropped under the river.

This experience was a costly wake-up call on the importance of infrastructure asset management (AM). Had an effective AM program been in place that included routine inspection/condition monitoring of all assets, the problem could have been discovered before the collapse and pipe rehabilitation by lining would have saved over half a million dollars in repair costs and hundreds of man-hours of CVWRF's and GHID's staff time.

Can your entity afford to not develop an infrastructure AM program? If you have a new collection or treatment

system, a lot of money, and don't care about optimizing its expenditure over time the answer is Yes - at least for a while. However, this doesn't describe the majority of systems in Utah, many of which are older (30 to 70 years of age) and have limited funding available for replacement.

Infrastructure AM is all about the systematic management of physical assets to maintain a desired level of service at the lowest life-cycle cost. Lowest life-cycle cost refers to the overall lowest cost for purchasing, operating, maintaining, rehabilitating, and eventually replacing the asset over time. A thorough AM program includes: a detailed inventory of assets; knowledge of the asset age, condition, and criticality; assessment of risks associated with failure; maintenance and rehabilitation requirements; life-cycle costing; and long-range financial planning. AM programs with good data - including those items listed above are the best approach for meeting this challenge and putting your system on the road to long-term sustainability.

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What are the major benefits of implementing an infrastructure asset management program?

- Meeting user service expectations and regulatory requirements;
- Reduced level of emergencies and improved safety of assets;
- Prolonged asset life through efficient and focused maintenance and rehabilitation;
- Effective prioritization of rehabilitation and replacement needs to make the best use of limited funds and reduce risk;
- Reduced overall costs for both operations and capital expenditures;
- Budgets focused on activities critical to sustained performance;
- Rate structures based on sound operational and financial planning;
- Long-term system sustainability.

Who should do asset management?

You Should! AM programs are scalable and can be implemented by systems of any size using tracking and analysis tools from simple spreadsheets all the way up to advanced software packages. Whether running a small system serving a few hundred users or a large system like CVWRF with hundreds of thousands of users, AM principles provides the means to put in place a long-term plan and funding strategy that will sustain your system and the important service it provides.

There are many resources available that describe asset management principles and techniques in much more detail than I have done here. These include WEF and EPA documents as well as papers, presentations, and reports from engineering consultants and wastewater agencies, many of which are available on-line. No matter what your role in your organization, you can contribute to implementing AM principles at your facility. Please take a moment to research on-line and learn more about infrastructure asset management.

Thanks for your attention. I hope you have an enjoyable fall and are able to join us for WEAU's upcoming Mid-Year Conference on November 12, 2015 at the Utah Cultural Celebration Center. [DRI](#)

Phil Heck, Ph.D., P.E.
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“Constant vigilance!”

Chad Burrell

A recent accident in our area took the life of a construction worker. Though it was not someone I personally knew or worked with it caused me sorrow to consider the friends and family that this individual left behind and my heart

goes out to them. At Snyderville Basin WRD we feel very good about our safety program. We have monthly safety meetings, we have a safety and emergency response manual, we have fire extinguishers, first aid kits,

and all the PPE that is needed. This incident however, prompted me to want to remind all of our employees that my overall goal for our safety program was to have each of us return to our families every day unharmed. Accidents unfortunately can happen even when safety procedures are being followed, but we should always be diligent at following these procedures and reinforcing them. My reminder to all of you is to not allow yourself to become complacent. Webster defines complacency as follows:

Full Definition of **COMPLACENCY**

- 1: self-satisfaction especially when accompanied by unawareness of actual dangers or deficiencies
- 2: an instance of usually unaware or uninformed self-satisfaction

I hope that with reading this definition we can see two things. First I hope we can realize how an attitude of complacency could sneak its way into our own safety actions or programs. Second I hope you can be reminded about how this complacency could increase the potential for accidents. One of my favorite quotes from the J. K. Rowling's Harry Potter Novels comes from the over paranoid wizard and professor Mad Eye Moody who is always reminding students to have “Constant Vigilance!” I would remind all of us to do the same. **DT**

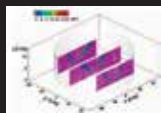


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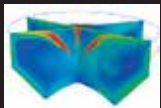


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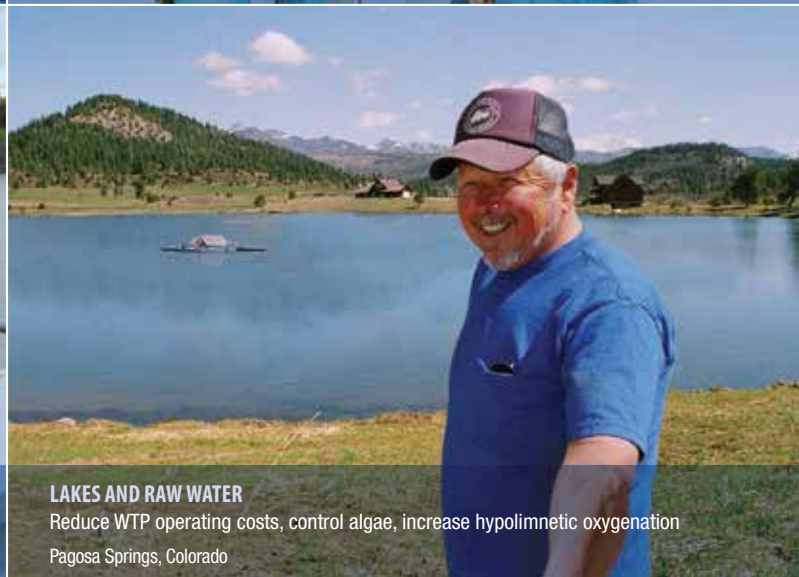
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2015 MID-YEAR CONFERENCE

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Are you a professional engineer? It is required that you complete a minimum of 30 hours of professional continuing education within a two-year renewal cycle. The time you spend in sessions at the conference counts toward your continuing education requirement.

REGISTRATION

Please complete registration before October 30, 2015 for the best rates. Registration information is available at www.weau.org. A continental breakfast and lunch are provided as part of the registration.

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2015

WEAU MID-YEAR CONFERENCE TECHNICAL SESSION SCHEDULE

CONFERENCE SCHEDULE	
TIME	EVENT
8:00-8:30	Registration and Continental Breakfast
8:30-10:00	Morning Sessions
10:00-10:20	Break
10:20-11:50	Late Morning Sessions
12:00-1:20	Lunch and Keynote Speaker
1:30-3:00	Afternoon Sessions
3:00-3:20	Break
3:20-4:00	Late Afternoon Sessions
4:00	Return Lanyards and Prize Drawing

PRELIMINARY TECHNICAL SESSION LISTING			
MANAGEMENT	SLUDGE DIGESTION	OPERATIONS	COLLECTIONS
Tailoring Alternative Delivery to Meet Your Needs: Case Study from a 20 Year Wastewater Improvement Program (Chris Cleveland, Ryan Dooley - Brown & Caldwell)	Innovations in Anaerobic Digestion (Rashi Gupta - Carollo Engineers)	The Amazing Underworld of Water and Waste (Ken Burgener - North Davis Sewer District)	Corrosion Resistant Materials for Construction and Rehabilitation of Wastewater Collection Systems (Sam Grenlie - Brown & Caldwell)
Asset Management Based Capital Improvement Program - CVWRF's Experience (Phil Heck, Brandon Heidelberger - Central Valley Water Reclamation Facility/Brown & Caldwell)	Modifying the ADM1 Model to Predict the Performance of the Anaerobic Digester when Co-Digesting Bakery Waste with Municipal Sludge (Morris Demitry - Utah State University)	In House Upgrades (Tom Anderson, Myron Backman, Kerry Lee - North Davis Sewer District)	Liv'n the Trenchless Life (Lawrence Trillo - Claude H. Nix Construction)
Wastewater is No More Wastewater - Removal to Recovery (Simmi Chahal, Ramesh Goel - University of Utah)	PRETREATMENT	Do It Yourself (Ed Marsing, Eric Nemcek - South Davis Sewer District)	Flow Metering (Mike Foerster, Lonn Rasmussen - South Valley Sewer District/Cottonwood Improvement District)
	Septic Issues from a Pumper's Perspective (Paul Krauth - Utah Department of Environmental Quality)		
Cyber Liability Risks to Water Organizations (Darrell Child, Steve Cain - Olympus Insurance)	Septic Issues from a Local Health and Pretreatment Coordinator's Perspective (Paul Krauth - Utah Department of Environmental Quality)	In House Upgrades (Jerry Lindeman - South Valley Sewer District/Jordan Basin Water Reclamation Facility)	Nozzle Selection (Dave Denny - Twin-D)
NUTRIENT	TREATMENT TECHNOLOGIES	Plant Optimization (Matt Burlison, Clay Marriott - Central Weber Sewer Improvement District)	Chemical Root Control (Justin Fern - Douglas Chemical)
The Future Direction of Nutrient Removal at Central Valley Water Reclamation Facility (Henryk Mercer, Phil Heck, Trevor Lindley - Central Valley Water Reclamation Facility, Brown & Caldwell)	True Batch - How an SBR Operates (Steve Stanish - Aqua Aerobics)		
Impacts from Ferric Addition for Phosphorous Removal (David Hatch - Brown & Caldwell)	Bipolar Ionization Odor and Corrosion Control (Stuart Humphries - Aerisa)		
Nutrient Update (Walt Baker - Utah Department of Environmental Quality)	WATER QUALITY	CVWRF Trickling Filter Upgrades (Jared O'Brien - Central Valley Water Reclamation Facility)	Bypass Pumping (Steven Meyer - Bowen Collins & Associates)
	What's New with DEQ (Various DEQ Staff - Utah Department of Environmental Quality)	Optimization for Centrifuge Dewatering (Rashi Gupta, Steve Walker - Carollo Engineers)	Workplace Safety (Chad Burrell, Snyderville Basin Water Reclamation District)

Out with the old/in with the new

By Gordon Evans, PWO Representative

As you all know Utah is sending two teams to the National Operations Challenge event again this year. As an organization we are proud to sponsor and support these teams. Participants from the 2014 annual conference challenge event held in St. George, Utah will make up the two teams. Central Valley Water Reclamation's team "Wasted Gas" was the overall winner with Shawn Groberg acting as coach and Joshua Hunsaker, Jared Obrien, Hadley Gunn, Van Bills and Mike Earl as team members. The members of the Wasatch All-Star team this year are, Steve Lloyd, (South Valley Sewer/Jordan Basin) Coach, with Rob Jaterka (Magna Water) Jordan Probst (Snyderville Basin) Kevin Draper (Central Weber) and Tom Anderson (North Davis). This year the teams will be competing in the usual five events, Process control, Safety, Maintenance, Collections and Lab. There are a couple of changes to these events that the teams are getting used to such as the Collections event will incorporate the programming of an automatic sampler instead of taking a test to identify collection line problems. The biggest change will come in the way of the Laboratory event where teams for the last four years have been setting up a BOD (biochemical oxygen demand) test. The new event will now require the teams to Analyze and determine the alkalinity and ammonia values as process control tools for the operation of an aerobic wastewater treatment plant.

Teams will be required to analyze 12 different samples for Ph., alkalinity and ammonia. Samples will represent Raw Influent, Aeration basin 1, Aeration basin 2,

“The teams are excited to be able to participate this year and hope to have a great showing at National. Utah's teams have been ones to watch and we want to carry on that tradition.”

Aeration basin 3, Anaerobic Digester 1 and Belt Press 1 return. These tests will require teams to run straight and diluted samples of ammonia and alkalinity to determine the basic alkalinity needs of the treatment plant based on influent ammonia and alkalinity values. Once these values are identified, calculations will be performed to identify if adequate alkalinity is available to provide complete nitrification. If there is not enough then the amount of additional alkalinity will need to be calculated. In addition, profiling of aeration basins and final clarifiers will be part of this equation. Influent and effluent values will be determined by analysis, and appropriate remediation identified.

Proper laboratory techniques will be used for labeling of containers, rinsing glassware, measuring volumes, pipetting, and making dilutions as well as the set up and operation of specialized laboratory equipment. All necessary Laboratory safety precautions will be implemented by way of latex gloves, safety glasses and cut resistant gloves for handling and breaking of cuvettes. Good housekeeping practices will also be required by making teams keep their work space clean and dry.

Spills will need to be cleaned up as they occur and the work space cleaned and garbage properly disposed of after the testing is complete.

The teams are excited to be able to participate this year and hope to have a great showing at National. Utah's teams have been ones to watch and we want to carry on that tradition. We as a PWO organization want to also thank all those who put so much time and effort into making our Operations Challenge event the success that it is. We are also grateful to the facilities, coworkers and managers that get behind these guys and allow them to participate especially on a National level. We are also grateful to the WEAU board for supporting this event like they do.

Now just a reminder, it's not too late to start thinking about next year's St. George challenge at the annual conference. We would love to have everyone participate that wants to. If you are the only one from your facility that can join a team we would love to put you with others and form a composite team. We are also looking for a Managers team this year, so all your supervisors and General Managers, come and play with us. [D&B](#)

Spotlight on Trace Workman

By Jared O'Brien

This quarter's *Digested News* spotlight is Trace Workman. Trace works for Central Davis Sewer District, Trace has been with Central Davis for 17 years. He has obtained a WWTreatment IV certification and also a WWCollections IV certification. Trace attended four years at Weber State University. He grew up in the small town of Richmond, UT but

now lives in Layton, UT with his wife (Stephanie) and his four children. Trace and Stephanie have been married for sixteen years.

Every spring during branding season Trace and his family go work on a ranch up in Idaho. Trace is also an avid bow hunter, he enjoys hunting deer and elk. On Trace's spare time he enjoys playing

softball, riding motorcycles especially Italian sport bikes. During the winter months Trace likes to go play in the powder on his snowmobiles. He also goes snowboarding through Utah's beautiful backcountry. [D&B](#)



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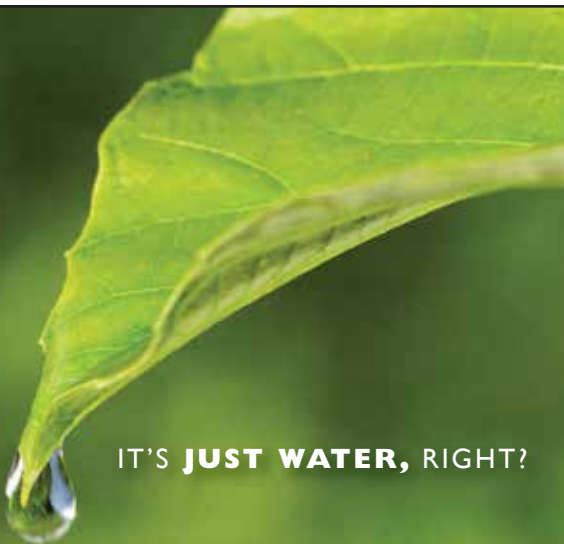
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Disinfection Quiz

By Gordon Evans

Questions courtesy of Waterford Systems – Salt Lake City, Utah

- | | | |
|---|--|---|
| <p>1. Dry chlorine itself is not corrosive, and may be shipped in steel containers. T/F</p> <p>2. Chlorine in hypo-chlorite forms (powder or liquid) is sometimes thought to be “safer” to use than gaseous form. T/F</p> <p>3. Chlorine is non-flammable. T/F</p> <p>4. Gaseous chlorine is the safest and most inexpensive way to chlorinate. T/F</p> <p>5. When drawing chlorine from a Ton Cylinder, liquid can be drawn from the top of the cylinder. T/F</p> <p>6. Chloramines are 25 times less effective than free chlorine for disinfecting. T/F</p> | <p>7. When calculating chlorine dose rates using Calcium Hypo-chlorite it is important to know?</p> <p>A. The specific gravity of chlorine granules.</p> <p>B. The weight of the container it’s shipped in.</p> <p>C. The % of available chlorine in the granules.</p> <p>D. How old the granules are.</p> <p>8. Chlorine is dangerous. At what concentration will exposure cause serious health consequences?</p> <p>A. 3 PPM.</p> <p>B. 15 PPM.</p> <p>C. 40 – 60 PPM.</p> <p>D. 1000 PPM.</p> | <p>9. How many gallons of 6% Sodium Hypo-chlorite would be needed to disinfect 500 feet of 4-inch pipe at 1ppm? Note: A 4-inch pipe holds 64 gallons per 100/feet?</p> <p>Answer should be in ounces.</p> <p>A. 0.15 oz. B. 41.6 oz.</p> <p>C. 0.002 oz. D. 0.64 oz.</p> <p>10. A water storage tank requires disinfection before it can be placed into service. It measures 50 feet in diameter, and is 20 feet high. A chlorine residual of 25 ppm is required. Assume a 10 ppm chlorine demand. How many pounds of calcium hypo-chlorite, 65% available chlorine will be required?</p> <p>A. 55.7 lbs. B. 130 lbs.</p> <p>C. 149 lbs. D. 93 lbs.</p> |
|---|--|---|

ANSWERS:

1. True. Dry chlorine itself is not corrosive but it combines very rapidly with moisture to form acids which can be extremely corrosive.

2. False. Hypo-chlorites are just as potentially dangerous as gas but are more difficult to handle and dispense.

3. True. Chlorine is non-flammable but will support combustion of other materials to the point of being explosive.

4. True.

5. False. Gas can be drawn from the top, Liquid must come from the bottom.

6. True. Breakpoint chlorination must be reached to rid the water of chloramines before free chlorine can be utilized for disinfection.

7. B. The % of available chlorine in the granules.

8. C. 40 – 60 PPM is very dangerous in 30 to 60 minutes. Up to 30 ppm, recoverable health issues. 1000 ppm kills in minutes.

9. D. 0.64 oz.

10. B. 130 pounds.

$$.785 \times 50' \times 50' \times 20' \times 7.48 \text{ gal/cu.ft.} = 293590 \text{ gallons} \div 1,000,000 \text{ gallons} = 0.29 \text{ MG}$$

$$\text{Dose} = \text{Demand} + \text{Residual } 35 \text{ PPM} = 25 \text{ PPM} + 10 \text{ PPM}$$

$$0.29 \text{ MG} \times 35 \text{ PPM} \times 8.35 \div 0.65 \text{ (65\% active)} = 130 \text{ Lbs}$$

It's all about the money

By Lon Rasmussen

Upgrades to a lift station are being looked at. Your job is to figure out the operating budget for the lift station if the proposed upgrades are done.

1. What motor horsepower will the new station need given the following information? Average flow into the lift station is .5 CFS, head pressure is 65 PSI, efficiency of the pump is 87% and the efficiency of the motor is 85%?
2. What is the cost to run the pump for a year given the following information? Cost per KW hour is \$.08. Run time per day is 5.25 hours.
3. Ferrous Chloride is to be added to the wet well to stop H2S corrosion. Proposed dose 6 PPM. Ferrous Chloride costs \$109.00 per 100 lbs how much will it cost treat the flow for a year?
4. What is the operating budget for the lift station for a year?

Answers:

$$1. \frac{.5 \text{ cf}}{\text{sec}} \times \frac{60 \text{ sec}}{1 \text{ min}} \times \frac{7.48 \text{ gal}}{1 \text{ cf}} = 224 \text{ gpm} \quad 65 \text{ psi} \times \frac{2.31 \text{ ft hd}}{1 \text{ psi}} = 150.15 \text{ ft hd}$$

$$11.48 \text{ Hp} = \frac{224 \text{ gpm} \times 150.15 \text{ ft hd}}{3960 \times .87 \text{ Ep} \times .85 \text{ Em}}$$

Round to 12 Hp

$$2. 12 \text{ Hp} \times \frac{.746 \text{ kW}}{1 \text{ Hp}} = 8.952 \text{ kW} \quad 8.952 \text{ kW} \times 5.25 \text{ hrs/day} = 46.998 \text{ kWhrs/day}$$

Round to 47

$$47 \text{ kWhrs/day} \times \$0.08/\text{kW} = \$3.76/\text{day} \quad \$3.76/\text{day} \times 365 \text{ days/year} = \$1,372.40/\text{year}$$

$$3. 6 \text{ PPM} = 6 \text{ mg/l} \quad .5 \text{ cfs} \times \frac{.646 \text{ MGD}}{1 \text{ cfs}} = .323 \text{ MGD}$$

$$16.2 \text{ lbs/day} = .323 \text{ MGD} \times 6 \text{ mg/l} \times 8.34 \text{ lbs/gal}$$

$$16.2 \text{ lbs/day} \times 365 \text{ days/year} = 5,913 \text{ lbs year}$$

$$\frac{5,913 \text{ lbs/year}}{100 \text{ pound bags}} = 59.13 \text{ or } 60 \text{ of the } 100 \text{ lbs bags}$$

$$60 \text{ bags} \times \$109 / \text{bag} = \$6,540 \text{ for chemicals}$$

$$4. \$6,540 + \$1,372.40 = \$7,912.40 \text{ total budget cost/year. } \text{DIN}$$











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DRAINAGE AND OUTFALL LINES

CheckMate® Inline Check Valves have become a frequently specified solution for commercial and residential areas where complete, dependable backflow prevention is necessary. The CheckMate® Valve's maintenance-free, passive operation provides years of trouble-free service – even when the valve is partially buried.



SERIES 35-1 CHECK VALVES

The flat-bottom Series 35-1 features an integral rubber flange, allowing them to be mounted to flanged outfall pipes or directly to headwalls where the pipe is flush. The flange size drilling conforms to ANSI B16.10, Class 150#, or can be constructed with DIN, 2632 and other standards. The Series 35-1 Check Valve is furnished complete with steel or stainless steel backup rings for installation.



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CheckMate® Inline Check Valves are used for interceptor and manhole installations because they are ideal for preventing water from backflowing into a sewage treatment plant. The CheckMate® Valve's innovative inline design allows it to be installed without modifications to structures such as interceptors, manholes and vaults.



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The Tideflex® Series 39 Inline Check Valve features a fabric-reinforced elastomer check sleeve housed in a cast iron body with ANSI 125/150 flanges, allowing for easy installation into any piping system. The valve's operation is silent, non-slamming and maintenance free. Sliding, rotating, swinging and plunging parts are completely eliminated. The body is equipped with flush ports and a clean-out port and can be epoxy coated.



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Target fixation

By Curt Simmons, WEAU Safety Committee

Target Fixation is a phenomenon in which an individual becomes so focused on an object that their awareness of hazards or obstacles diminishes. The phenomenon is most commonly associated with scenarios in which the observer is in control of a vehicle, aircraft or other mode of transportation. In such cases, the observer may fixate so intently on the target that they will not take necessary action to avoid it, thus colliding with it.

This phenomenon is common among racing drivers, fighter pilots, motorcyclists, mountain bikers, and surfers, as well as many others. When individuals target fixate, they are prone to steer in the direction of

their gaze, which is often the ultimate cause of a collision. The term target fixation was used in World War II by fighter-bomber pilots to describe pilots flying into targets during a strafing or bombing run, literally crashing into the enemy target without an attempt to avoid it.

Target fixation and industry

Are you target fixated? If our focus is not on looking for all the problems and situations, we are the enemy. We can become so target fixated on these things that we end up going deeper and deeper into them and end up, like the bomber pilot, crashing into the target. We can become so fixated with the world around us and what the enemy is doing that we forget where our target should be.

If we only concentrate on the task at hand, how can we look at all the other situations that materialize while we are fixated on a single task? The target becomes the task at hand and the enemy is anything else that appears out of the normal while trying to complete that task. Imagine all of the many things that can go wrong if you are concentrating on your family life, children, work situations, etc. and not the task. One of the most popular excuses that safety professionals hear every time there is an accident is “I didn’t see that...tree, pole, car, spinning blade, missing guard, etc.” They didn’t see the hazard because of what they are focused on even though it was right in front of their eyes!

How to avoid target fixation

Recognizing that you are fixating is half the battle. Recognizing hazards is always the most important part of protecting yourself from injury. Wastewater workers need only step from the breakroom and they are faced with a new or different risk. Below are some of the ways to fix the problem with target fixation:

- Avoid trying to solve a problem before you understand the problem.
- Your hands will follow your eyes. So, to avoid target fixation avoid focusing on the hazard.
- Talk yourself through the task, almost as if you are reading a step-by-step manual.
- Don’t be caught by surprise. Think about what may happen at each different phase of the task.
- Concentrate on the job at hand and do not let yourself become distracted.
- Expect the unexpected, have a plan worked out if something goes wrong.
- Work out “what if” scenarios for every phase of the task or operation.

The next time you are working on a project, try the above tricks and see if they can help you avoid an injury. Our industry is wrought with dangers from chlorine, confined spaces, toxic gases, chemicals, work in traffic, etc. Don’t let yourself be surprised by hazards that seem to come from nowhere. They are there all along, you just do not recognize them before you crash. **DAI**



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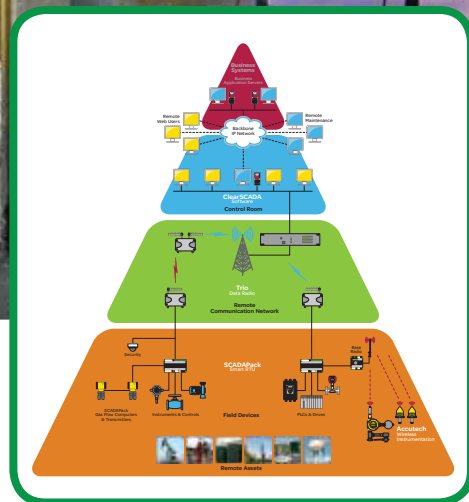
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Pretreatment.... What are we doing?

By Sarah Leavitt

The Pretreatment Committee has been working on a Fall and Spring training for the Pretreatment Group. The Fall training, held September 17, consisted of presentations on Enforcement Action, Roadmap and Allocation of Local Limits, Airport Deicing and Dairies Pretreatment Process. After lunch attendees were invited to tour two facilities in the Central Weber Sewer Improvement District.

The Spring Training will be held on February 25 at ULGT building. The Pretreatment Committee is working on inviting industries from around the State to come present about their process. It will be a great training for everyone who attends. [DN](#)

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Register by: January 6, 2016

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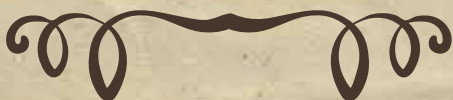
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WEAU Jordan River

By Christina Osborn


CLEANUP

On Saturday, August 8, 36 of us rolled out of bed to help with the 2nd Annual WEAU Jordan River Cleanup with the Jordan River Commission. The 36 included 6 WEAU members and 15 family members, who were mostly under the age of four, and about 15 boy scouts. Those WEAU members attending included Brian Mansell (Brown & Caldwell), Jacob Young (Brown & Caldwell), Michael Moe (WesTech), Matt Williams (WesTech), Gary Vance (J-U-B Engineers) and Christina Osborn (J-U-B Engineers). After loading up on sugary donuts and juice boxes we proceeded with caravanning to our work location and then our task. Our top secret work location was the Legacy Nature Preserve, which is normally closed to the public, adjacent to the South Davis South Wastewater Treatment Plant. Our goal was to plant 85 trees, yes, 85 trees! So, we weren't actually tasked with cleaning up the Jordan River, instead we were creating habitat for migratory birds at the Legacy Nature Preserve. Eric McCulley and his colleagues from River Restoration provided lots of guidance on where and how to plant the trees and what we were planting. Then, after we were done, Eric did a program for the kids centered on teaching them the importance of habitat for the migratory birds.

A few years ago during the 1st Annual WEAU Jordan River Cleanup we worked with Eric and others to clean up the River both on foot and via canoe. We cleaned up a stretch of the Jordan River as it rolls through the Legacy Nature Preserve. For all those who would like another shot at cleaning up the River by canoe there is a cleanup event scheduled for September 12, 2015. Check the Jordan River Commission's website for more information about this or future volunteer events: <http://jordanrivercommission.com/>.

Both WEAU events are part of the "Lower Jordan River Education Outreach, Riparian Habitat Enhancement and River Cleanup Project." The goals of the three year project are to:

1. Develop Community Stewardship and Support,
2. Develop and Implement Jordan River Focused Environmental Curricula and Place-Based Learning in Public Education,
3. Provide a Framework for Collaborative Management, and
4. Improve Ecosystem Integrity.

Thanks to Eric and Holly at the Jordan River Commission. We had lots of fun (who wouldn't with all you can eat donuts and juice boxes) and success (despite a crew of mainly toddlers). Thanks everyone! 





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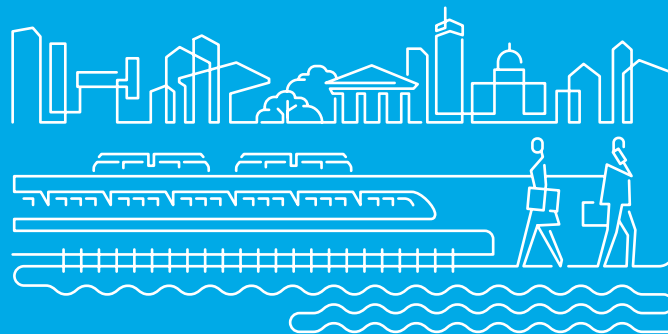


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Granular Activated Sludge Technology: AN INNOVATION IN WASTEWATER TREATMENT

By Sunayna Dasgupta and Ramesh Goel – Civil & Environmental Engineering, University of Utah

The activated sludge treatment process is a widely used method for municipal wastewater treatment and is employed worldwide. In the activated sludge process, a complex community of prokaryotes and protozoa is used to degrade/remove various contaminants of concern in the influent of a municipal waste water treatment plant. A variety of bacteria present in the bioreactor consume these contaminants following the specific redox chemistry in the presence and/or absence of oxygen. While the activated sludge process is a mature, engineered system, with a well-studied microbial ecology, it is not without problems. Chief among these problems are biomass bulking and foaming due to the overgrowth of filamentous and foaming bacteria. Filamentous bulking interferes with efficient settling leading to high sludge volume index (SVI) values. SVI is a common indicator used to define sludge settling characteristics.

Granular activated sludge technology is an innovative and promising biological treatment process which results in a smaller footprint and easier management of sludge.

This process focuses on the application of aerobic granular sludge for biological treatment of wastewater. Aerobic granules are dense microbial aggregates composed of a self-immobilized biofilm without any support carrier. Aerobic granules have been cultivated in Dr. Goel's lab at the University of Utah.

Fig 1 (a) shows aerobic granules at the end of 90 days using synthetic wastewater as feed with acetate as the sole carbon source.

Fig 1 (b) depicts conventional settled biomass (left side) and settled granular biomass (right side) in separate graduated cylinders. The settling time of conventional activated sludge biomass was about 50 times more than that of the granular biomass suggesting a dramatic improvement over the conventional activated sludge process in terms of settling characteristics.

In comparison to conventional activated sludge flocs, aerobic granules

have exceptional settleability, a compact and robust microbial structure with diverse microbial species, and an ability to withstand shock loadings and treat toxic compounds. The ability to conduct simultaneous nitrification and denitrification even under microaerobic conditions is truly exceptional. Due to its excellent settling characteristics, separation of sludge and effluent can take place in a single reactor without the requirement of a separate settling tank, resulting in a reduction of the overall footprint of a plant due to the elimination of that tank.

It has been observed that the overall footprint of granular sludge technology is 25% of conventional sludge technology due to reductions in construction costs, land requirements, and energy consumption. Hence it was concluded that Granular Activated Sludge Technology is more

“Granular activated sludge technology is an innovative and promising biological treatment process which results in a smaller footprint and easier management of sludge.”



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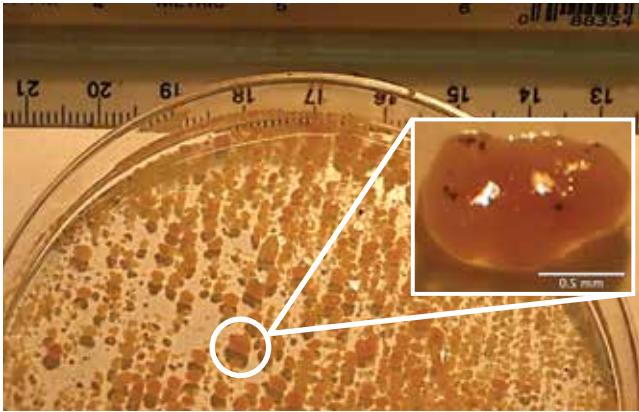


Fig 1. (a) Aerobic granules (3mm) cultivated after 90 days of operation.



Fig 1. (b) Conventional reactor biomass (left) and Granular reactor biomass (right).

compact requiring investments that are 15-30% lower than conventional activated sludge technology (De Bruin et al., 2004).

Limitation of oxygen transfer in the inner layers of the granule leads to the formation of an outer oxic and inner anoxic layer in a mature granule. Thus, a mature granule contains alternating layers of nitrifiers (responsible for conversion of ammonia to nitrate), denitrifiers (responsible for conversion of nitrate to nitrogen gas) and PAOs (Polyphosphate accumulating organisms), facilitating simultaneous nitrification and denitrification (SND) and phosphorous removal from the wastewater. An average removal of 95-100% of COD, 94% of total nitrogen-N, and 94% PO_4^{3-} -P from wastewater has been noted.

To evaluate the above parameters, two lab-scale sequencing batch reactors

(SBR) were installed. Each reactor had a volume of 2.5L. One of the reactors was to achieve granulation and the other had same working conditions as a conventional activated sludge process reactor and was used as a control. The granular reactor had a higher H/D ratio as compared to the conventional reactor in order to achieve granulation. The granular and conventional reactors had an HRT of 8 hrs and 12 hrs respectively. Synthetic wastewater was used as a feed with acetate as the sole carbon source. The reactors performed in a fill, react, and decant cycle. Successful granulation was achieved at the end of 60 days.

The initial SVI of the granular reactor at start-up was 91.21 mL/g; it reduced to 40.5 mL/g indicating good settling characteristics of the biomass. The control reactor SVI reduced to 51.6 mL/g.

The granular biomass exhibited better settling characteristics than the conventional reactor biomass.

A complete cycle analysis of both reactors showed a complete removal of COD and ammonia. There was 100% phosphorous removal in the granular reactor whereas the conventional reactor did not have significant phosphorous removal. The production of residual nitrate was found to be higher in the conventional reactor than in the granular reactor.

The granular reactor indicated a better performance than the conventional reactor through the improved nitrogen and phosphorous removal characteristics. In summary, future applications of granular activated sludge should be explored. It offers several advantages over the conventional process. [DN](#)

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August 5, 2015

Dear House of Delegates Members:


I am writing at the request of the WEF Board to provide some important information about action taken last month when the Trustees approved the FY 2016 WEF budget, which includes a membership dues increase effective January 1, 2016. The Board wanted to make sure that our House of Delegates (HOD) members have both early notice regarding the increase and also background on ongoing and planned increases in member service and value.

While the increase is part of an overall plan developed in 2013, the WEF Board deliberated carefully before determining the amount of the dues increase to be included in the 2016 budget. The decision was influenced by the positive feedback we have received on our recent investments in innovation, in new practice areas, and in increased member and Member Association (MA) services. The Board's goal is to continue to grow services while maintaining a sustainable and nimble business model.

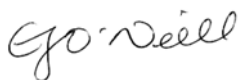
Although WEF's dues continue to be very competitive when compared with those of other national and international water organizations, the Board remains strongly focused on growing member value. We also are focused on operating an efficient organization with a low overhead in order to maximize member service and enhance the member experience. WEF's newly approved Strategic Plan supported by a business plan and success metrics will allow further alignment of resources.

Examples of the service enhancements that we will deliver in 2016 include expanded coverage of practice growth areas such as stormwater and resource recovery; complete overhauls of our websites to provide improved mobility, support, and enhance the engagement experience, and make it easier for members to locate resources; and improved partnership with MAs on member recruitment and retention. We also plan to continue providing our highly regarded webinars at no additional cost to WEF members. We hope that these examples of the ways we plan to increase our value to members give you a sense of our resolve to provide water professionals with the tools and support they need to succeed in their careers and in the important work that they do every day.

Our partnership with HOD is essential, and we therefore are providing you with early notice of the planned dues increase detailed in the attached Q&A document.

If you have questions about implementation of the 2016 dues increase, please do not hesitate to contact the key staff listed at the end of the Q&A document, or me personally at (703) 684-2430. As always, we greatly appreciate your leadership and service. 

Sincerely,



Eileen J. O'Neill, Ph.D.

Executive Director

eoNeill@wef.org

Questions/Answers

WEF 2016 Membership Dues Increase

How much will the WEF membership dues increase in 2016?

WEF will be implementing a dues increase for Professional, Academic, and PWO members, with all renewals and new memberships beginning January 1, 2016:

	2015	2016
Professional WEF Dues	\$116	\$133
Academic	\$116	\$133
PWO	\$62	\$71

When will the 2016 membership dues increase be implemented?

The dues will be effective January 1, 2016, and will be reflected in renewal notices generated beginning in November 1, 2015.

When does my Member Association (MA) need to notify WEF of the level of our 2016 dues?

The deadline for notifying WEF of 2016 MA dues is October 16, 2015.

Why are the membership dues being increased?

WEF is investing in your professional organization to ensure you have what you need to be successful in the water sector. It's an investment for the long term to keep WEF fiscally sound and able to deliver to you everything you need to stay ahead in this business.

While the increase is part of an overall plan developed in 2013, the Board deliberated carefully before determining the amount of a dues increase to be included in the 2016 budget. The decision was influenced by the positive feedback we have received on our recent investments in innovation, in new practice areas, and in increased member and MA services. The Board's goal is to continue to grow our services while maintaining a sustainable and nimble business model.

The Board remains strongly focused on growing member value while staying focused on operating an efficient organization with a low overhead in order to maximize member service and enhance the member experience. WEF's newly approved Strategic Plan supported by a business plan and success metrics will allow further alignment of resources.

Who should we contact if we have questions?

For logistics regarding implementation, please contact:

- **Wade Riess**
Director, Membership/
Customer Relations
wriess@wef.org
or 703-684-2400, x7420
- **Penny Young**
Deputy Executive Director/CFO
pyoung@wef.org
or 703-684-2425

For more detailed Q&A information, please contact:

- **Tim Williams**
Deputy Executive Director
twilliams@wef.org
or 703-684-2437
- **Penny Young**
Deputy Executive Director/CFO
pyoung@wef.org
or 703-684-2425
- **Linda Kelly, Sr.**
Director of Association
Engagement & Governance
lkelly@wef.org
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- **Dianne Crilley**
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The New OSHA Confined Spaces in Construction Standard

The new Occupational Health and Safety Administration (OSHA) Confined Spaces in Construction standard (29 CFR 1926, Subpart AA) incorporates several provisions to address construction-specific hazards, account for advancements in technology, and improve enforceability of the requirements. Other than these additions, the standard, which became effective on August 3, is similar in content and organization to the general industry confined spaces standard.

Construction is different than the typical general industry site in that a construction environment is continuously changing and often involves multiple employers. To address the unique nature of construction, the Confined Spaces in Construction standard places a greater emphasis on training, continuous worksite evaluation, and communication than the general industry standard. The organization, language, and most of the substantive requirements of the construction standard are based on the general industry standard.

Scope of the standard

The Confined Spaces in Construction standard applies to construction activities at a worksite with one or more confined spaces.

The presence of a confined space on the worksite triggers a requirement for all employers to ensure that their employees do not enter a confined space except in accordance with the requirements of the standard.

Even if an employer does not have employees who will enter a confined space, they are required to share information and coordinate with other employers if they have information necessary for the protection of workers inside confined spaces or are engaged in activities that could endanger the workers inside a confined space.

Excavations

Excavations are not considered confined spaces in the construction standard. OSHA believes that overlapping standards could be unnecessarily burdensome to employers or cause confusion about the appropriate procedures to use. Excavations are best addressed by the existing OSHA 29 CFR 1926 Subpart P Excavation standard.

Entry into a confined space within an excavation is governed by the confined spaces standard. For example, the interior of a manhole or pipe within an excavation may be a confined space.

Underground construction

OSHA 29 CFR 1926 Subpart S applies to the construction of underground tunnels, shafts, chambers, and other underground structures. To avoid confusion between different standards during the same underground construction project, OSHA treats nonstructural work performed in conjunction with initial construction of an underground space, as covered by Subpart S.

Confined space evaluations

Confined space evaluations are required to determine if spaces are indeed confined spaces and permit-required confined spaces. The evaluation must be performed by each employer who directs employees who may work in the confined space. The evaluations must be performed by a “competent person,” as defined by OSHA. OSHA added this competent-person requirement because the analysis required for these evaluations necessitates some expertise.

Employers may cooperate in identifying the confined spaces and permit-required confined spaces on a worksite, but each employer remains responsible for identifying spaces that could affect employees it directs.

Information sharing and coordination

Information sharing and coordination duties at multi-employer worksites are important provisions of the construction standard and include requirements for the host employer (owner/operator).

Controlling contractor

The controlling contractor is at the center of the information sharing and coordination process. Before any employer enters a permit space, the controlling contractor is required to obtain relevant information about confined spaces on the worksite from the host employer and then to relay that information to each contractor entering the confined space and to contractors performing work that could foreseeably result in a hazard within that confined space.

The controlling contractor is also responsible for coordinating work in and around confined spaces so that no contractor working at the site creates a hazard inside the confined space.

After the entry employer performs entry operations, the controlling contractor must debrief the entry employer to gather information that the controlling contractor then must share with the host employer and other contractors who enter the space later.

Host employer

The host employer owns or manages the property where the construction work is taking place. The host employer serves an important role in providing information because it is likely to be most familiar with the property and the most likely to retain information about permit spaces on the property between separate construction projects, particularly in construction involving existing facilities. The host employer is required to share information on “known” permit spaces.

“The Confined Spaces in Construction standard applies to construction activities at a worksite with one or more confined spaces.”

All employers

Each employer is required to notify its employees' representatives and the controlling contractor of the hazards of permit spaces and the location of those spaces.

This requirements applies to all employers who identify a permit space, even if they choose not to allow their employees to enter it.

Permit-required confined space entry program

The requirements for a permit-required confined space program and confined space entry procedures are almost identical to the general industry requirements. The construction standard also provides for alternate entry procedures and reclassification of permit-required spaces.

As part of the program, each entry employer must implement measures to prevent unauthorized entry; identify and evaluate the hazards of permit spaces before employees enter them; and develop and implement the means, procedures, and practices necessary for safe permit space entry operations.

Permit entry requires a permit, entry supervisor, attendant, and authorized entrants. Alternate entry and temporary reclassification require documentation.

Alternate entry procedures

Permit-required confined spaces may be entered under alternate entry procedures when the only hazard is

atmospheric and can be controlled through ventilation. The alternate entry procedure requirements are similar to the general industry provision.

Temporary reclassification

Permit-required confined spaces may be temporarily reclassified when there is no actual or potential hazardous atmosphere present in the space, and the employer eliminates all physical hazards in the space.


Employers may reclassify the space as a nonpermit space even if a physical hazard remains, so long as the hazard is completely isolated and employees cannot be exposed to it. For example, in covering agitator blades to prevent accidental contact with sharp edges, the hazard is still present in the space but isolated from contact.

Rescue and emergency services

The construction standard expands on the rescue requirements of the general industry standard clarifying how to assess the response and adequacy of rescue services. The employer who designates rescue services must verify that it has the capability to reach the victim(s) within a time frame that is appropriate for the permit space hazard(s) identified.

Nonentry rescue is required unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. The employer must designate an entry rescue service whenever nonentry rescue is not selected.

Whenever nonentry rescue is selected, the entry employer must ensure that retrieval systems or methods are used whenever an authorized entrant enters a permit space and must confirm, prior to entry, that emergency assistance would be available in the event that nonentry rescue fails.

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Help for States Considering Direct Potable Reuse

Framework provides guidance on program development and costs, federal regulations, and public outreach

As interest in direct potable reuse (DPR) has grown, so has the need to ensure water quality and safety. State regulators and local government and water utility decision-makers must make water supply decisions, but without specific criteria or guidelines, excessive treatment redundancies may result that impede or slow down projects, causing high costs, project delays, and public distrust.

As a result, a framework is being developed that outlines the most important issues that states will need to address as they develop DPR guidelines. This framework, which will be released in the fall, will focus on two forms of DPR, the first of which is defined as introducing highly treated wastewater effluent – with or without an engineered storage buffer – into the intake water supply upstream of a drinking water treatment facility. Another form introduces highly treated wastewater effluent directly into a drinking water distribution system. The framework is the culmination of a DPR framework project being developed

by the WateReuse Research Foundation (Alexandria, Virginia) in coordination with the Water Environment Federation (WEF; Alexandria, Virginia) and the American Water Works Association (Denver).

What the framework will include

DPR projects are not necessarily new; Windhoek, Namibia, has been operating one since 1967 that introduces water directly into the drinking water distribution system. In the United States, permitted operational DPR projects add highly treated wastewater ahead of a water treatment facility. Currently, only Wichita Falls and Big Spring in Texas have operational DPR facilities, but DPR is currently under consideration in California, New Mexico, and several other states.

The framework will summarize Texas' experience in implementing DPR and California's creation of regulations for groundwater recharge indirect potable reuse projects. This framework also will cover a broad spectrum of issues in DPR implementation, including

- a background on DPR as well as the cost of implementing a DPR program compared to other water resource options;
- public health protection and how DPR may be affected by existing federal statutes such as the Clean Water Act and Safe Drinking Water Act;
- source water control programs, wastewater treatment, advanced wastewater treatment, residuals management, and monitoring and control strategies; and
- system operation to ensure that utilities have sufficient staff training and resources to properly operate these systems, which in many cases are more advanced than traditional wastewater or drinking water treatment facilities.

Managing public perception

Water treatment technology and operations are an ever-evolving process, and technology and regulatory needs for DPR may require future development. In addition, public perception is important



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“A framework is being developed that outlines the most important issues that states will need to address as they develop DPR guidelines.”


in any statewide or local discussion of implementing a DPR program. Community organizations need to be engaged early to ensure that the public understands the DPR concept to dispel fears about using recycled water as a source of drinking water. The framework will include information on public outreach including the key factors that should be included in a communication plan, communication tools, as well as examples of successful DPR outreach programs.

The framework effort is part of a WaterReuse Research Foundation Direct Potable Reuse initiative that has already allocated \$5.8 million to fund 34 research projects. The National Water Research Institute (Fountain Valley, California) expert panel developing this framework is chaired by George Tchobanoglous of the University of California-Davis along with Joseph Cotruvo of Joseph Cotruvo & Associates, Jim Crook, Ellen McDonald

of Alan Plummer Associates, Adam Olivieri of EOA Inc., Andrew Salvesson of Carollo Engineers, and R. Shane Trussell of Trussell Technologies Inc.

The framework directly addresses a key theme of found in EPA’s Water Technology Innovation Blueprint. The Blueprint outlines the business case for investment in new tools in the 10 most promising market opportunities in the water quality sector, one of which is “Conserving and Eventually Reusing Water.” Intended to be released by WEFTEC 2015 (September 26–30, 2015) in Chicago, the framework will be featured at the WEFTEC Innovation Pavilion discussion “Overcoming Barriers to Water Reuse.”

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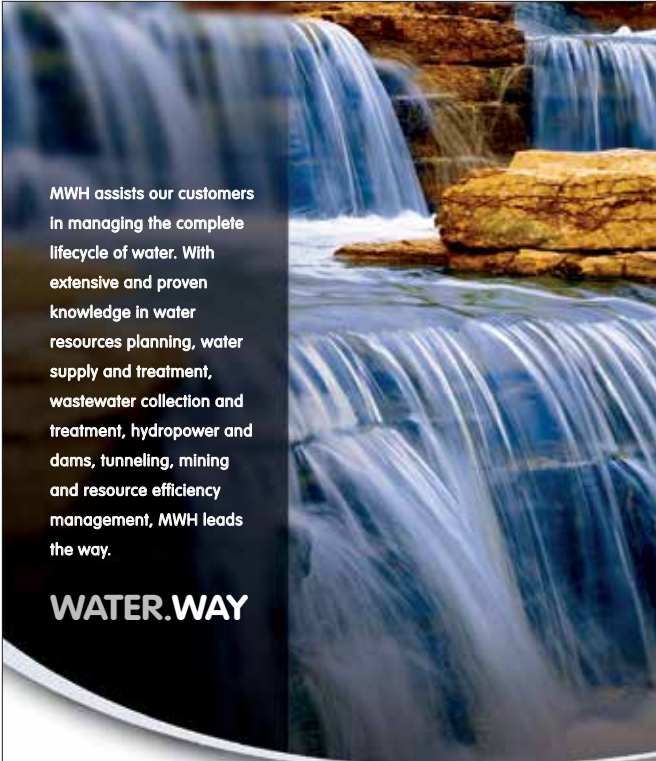


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How Alkalinity Affects Nitrification

Use alkalinity profiling in wastewater operations to control biological activity and optimize process control

The Water Environment Federation's new Operations Challenge laboratory event will determine alkalinity needs to facilitate nitrification. Operators will evaluate alkalinity and ammonia by analyzing a series of samples similar to those observed in water resource recovery facilities.

This event will give operators an understanding of how alkalinity works in the wastewater treatment process to facilitate nitrification, as well as the analytical expertise to perform the tests onsite. This provides the real-time data needed to perform calculations, since these analyses typically are performed in a laboratory that can present a delay in the data.

What is alkalinity?

The alkalinity of water is a measure of its capacity to neutralize acids. It also refers to the buffering capacity, or the capacity to resist a change in pH. For wastewater operations, alkalinity is measured and reported in terms of equivalent calcium carbonate (CaCO_3). Alkalinity is commonly measured to a certain pH. For wastewater, the measurement is total alkalinity, which is measured to a pH of 4.5 SU. Even though pH and alkalinity are related, there are distinct differences between these two parameters and how they can affect your facility operations.

Alkalinity and pH

Alkalinity is often used as an indicator of biological activity. In wastewater operations, there are three forms of oxygen available to bacteria: dissolved oxygen (O_2), nitrate ions (NO_3^-), and sulfate ions (SO_4^{2-}). Aerobic metabolisms use dissolved oxygen to convert food to energy. Certain classes of aerobic bacteria, called nitrifiers, use ammonia (NH_3) for food instead of carbon-based organic compounds. This type of aerobic metabolism, which uses dissolved oxygen to convert ammonia to nitrate, is referred to as "nitrification." Nitrifiers are the dominant bacteria when organic food supplies have been consumed.

Further processes include denitrification, or anoxic metabolism, which occurs when bacteria utilize nitrate as the source of oxygen and the bacteria use nitrate as the oxygen source. In an anoxic environment, the nitrate ion is converted to nitrogen gas while the bacteria converts the food to energy. Finally, anaerobic conditions will occur when dissolved oxygen and nitrate are no longer present and the bacteria will obtain oxygen from sulfate. The sulfate is converted to hydrogen sulfide and other sulfur-related compounds.

Alkalinity is lost in an activated sludge process during nitrification. During nitrification, 7.14 mg of alkalinity as CaCO_3 is destroyed for every milligram of ammonium ions oxidized. Lack of carbonate alkalinity will stop nitrification. In addition, nitrification is pH-sensitive and rates of nitrification will decline significantly at pH values below 6.8. Therefore, it is important to maintain an

adequate alkalinity in the aeration tank to provide pH stability and also to provide inorganic carbon for nitrifiers. At pH values near 5.8 to 6.0, the rates may be 10% to 20% of the rate at pH 7.0. A pH of 7.0 to 7.2 is normally used to maintain reasonable nitrification rates, and for locations with low-alkalinity waters, alkalinity is added at the water resource recovery facility to maintain acceptable pH values. The amount of alkalinity added depends on the initial alkalinity concentration and amount of $\text{NH}_4\text{-N}$ to be oxidized. After complete nitrification, a residual alkalinity of 70 to 80 mg/L as CaCO_3 in the aeration tank is desirable. If this alkalinity is not present, then alkalinity should be added to the aeration tank.

Why is alkalinity or buffering important?

Aerobic wastewater operations are net-acid producing. Processes influencing acid formation include, but are not limited to

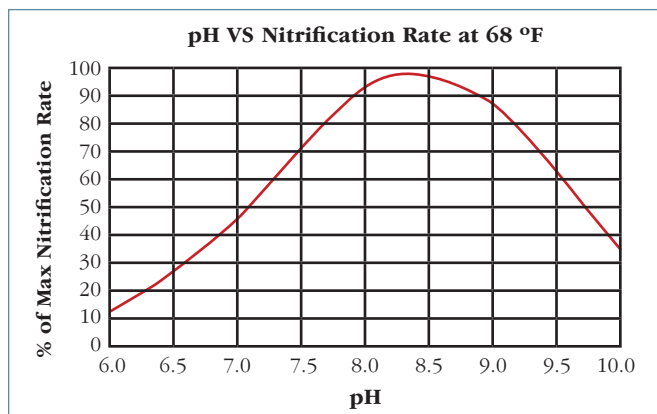
- biological nitrification in aeration tanks, trickling filters and rotating biological contactors;
- the acid formation stage in anaerobic digestion;
- biological nitrification in aerobic digesters;
- gas chlorination for effluent disinfection; and
- chemical addition of aluminum or iron salts.

In wastewater treatment, it is critical to maintain pH in a range that is favorable for biological activity. These optimum conditions include a near-neutral pH value between 7.0 and 7.4. Effective and efficient operation of a biological process depends on steady-state conditions. The best operations require conditions without sudden changes in any of the operating variables. If kept in a steady state, good flocculating types of microorganisms will be more numerous. Alkalinity is the key to steady-state operations. The more stable the environment for the microorganisms, the more effectively they will be able to work. In other words, a sufficient amount of alkalinity can provide for *improved performance and expanded treatment capacity*.

How much alkalinity is needed?

To nitrify, alkalinity levels should be at least eight times the concentration of ammonia in wastewater. This value may be higher for untreated wastewater with higher-than-usual influent ammonia concentrations. The theoretical reaction shows that approximately 7.14 mg of alkalinity (as CaCO_3) is consumed for every milligram of ammonia oxidized. A rule of thumb is an 8-to-1 ratio of alkalinity to ammonia. Inadequate alkalinity could result in incomplete nitrification and depressed pH values in the facility. Plants with the ability to denitrify can add back valuable alkalinity to the process, and those values should be taken into consideration when doing mass balancing. (For Operations Challenge event, the decision has been made to not incorporate the denitrification step in process profiling.) To determine alkalinity requirements for plant operations, it is critical to know the following parameters:

Figure 1. pH versus nitrification rates at 68°F (maximum nitrification rate occurs at 8.0–8.5 pH)



Source: EPA-625/4-73-004a, *Revised Nitrification and Denitrification Facilities Wastewater Treatment*, U.S. Environmental Protection Agency Technology Transfer Seminar.

- influent ammonia, in mg/L,
- influent total alkalinity, in mg/L, and
- effluent total alkalinity, in mg/L.

For every mg/L of converted ammonia, alkalinity decreases by 7.14 mg/L. Therefore, to calculate theoretical ammonia removal, multiply the influent (raw) ammonia by 7.14 to determine the minimum amount of alkalinity needed for ammonia removal through nitrification.

For example:

Influent ammonia = 36 mg/L
 36 mg/L ammonia x 7.14 mg/L alkalinity to nitrify = 257 mg/L alkalinity requirements
 257 mg/L is the minimum amount of alkalinity needed to nitrify 36 mg/L of influent ammonia.

Once you have calculated the minimum amount of alkalinity needed to nitrify ammonia in wastewater, compare this value against your measured available influent alkalinity to determine if enough is present for complete ammonia removal, and how much (if any) additional alkalinity is needed to complete nitrification.

For example:

Influent ammonia alkalinity needs for nitrification = 257 mg/L
 Actual measured influent alkalinity = 124 mg/L
 257 - 124 = 133 mg/L deficiency

In this example, alkalinity is insufficient to completely nitrify influent ammonia, and supplementation through denitrification or chemical addition is required. Remember that this is a minimum – you still need some for acid buffering in downstream processes, such as disinfection.

Bioavailable alkalinity

Most experts recommend an alkalinity residual (effluent residual) of 75 to 150 mg/L. As previously identified, total alkalinity is measured to a pH endpoint of 4.5. For typical wastewater treatment applications, operational pH never dips that low. When measuring total alkalinity, the endpoint reflects how much alkalinity would be available at a pH of 4.5. At higher pH values of 7.0 to 7.4 SU, where wastewater operations are typically conducted, not all alkalinity measured to a pH of 4.5 is available for use. This is a critical distinction for the bioavailability of alkalinity. Therefore, in addition to the alkalinity required for

Figure 2. Measurement of nitrification activity at a pH of 7.2 and lower

Nitrification Activities at pH 7.2 and below	
pH	Activity
7.2	1.00
7.0	0.83
6.8	0.67
6.6	0.50
6.4	0.34
6.2	0.17

nitrification, additional alkalinity must be available to maintain the 7.0 to 7.4 pH. Typically, the amount of residual alkalinity required to maintain pH near neutral is between 70 and 80 mg/L as CaCO₃.

Proper alkalinity levels for treatment

Alkalinity is a major chemical requirement for nitrification and can be a useful and beneficial tool for use in process control. Several things to keep in mind:

- Alkalinity provides an optimal environment for microscopic organisms whose primary function is to reduce waste.
- In activated sludge, the desirable microorganisms are those that have the capability, under the right conditions, to clump and form a gelatinous floc that is heavy enough to settle. The formed floc or sludge can be then be characterized as having a sludge volume index.
- The optimum pH range is between 7.0 and 7.4. Although growth can occur at pH values of 6 to 9, it does so at much reduced rates (see Figures 1 and 2). It is also quite likely that undesirable forms of organisms will form at these ranges and cause bulking problems. The optimal pH for nitrification is 8.0, with nitrification limited below pH 6.0.
- Oxygen uptake is optimal at a 7.0 to 7.4 pH. Biochemical oxygen demand removal efficiency also decreases as pH moves outside this optimum range.

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Mary Evans is a regional account manager for Premier Magnesia (Flint, Texas). She is a past president of the Water Environment Association of Texas and is the laboratory event coordinator of the WEF Operations Challenge Committee. **Gary Sober** is the vice president of technology for Byo-Gon Inc. (Chandler, Texas).

U.S. EPA Finalizes the Clean Water Rule

On May 27, the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (USACE) finalized the Clean Water Rule (<http://www2.epa.gov/cleanwaterrule>), which EPA and the USACE believe, ensures that waters protected under the Clean Water Act are more precisely defined and predictably determined, making permitting less costly, easier, and faster for businesses and industry.

The rule, published in the *Federal Register* on June 29, is expected to become effective August 28, depending on the outcome of some lawsuits filed by a number of states seeking to stop the rule from going into effect. The rule is grounded in law and the latest science, according to an EPA fact sheet (<http://www2.epa.gov/cleanwaterrule/documents-related-clean-water-rule#Fact>), and it received substantial public input from more than 400 stakeholder meetings and more than 1 million public comments. EPA and USACE also maintain that the rule creates no new permitting requirements for agriculture and maintains all previous exemptions and exclusions, including dredged or fill requirements.

Stormwater controls not affected

In general, the Clean Water Rule clarifies which bodies of water are classified as “waters of the United States,” thereby requiring federal pollution controls. The Rule maintains the current status of municipal separate storm sewer systems (MS4s) and

“According to EPA, 60% of U.S. stream miles flow only seasonally or after rain, and 1 in 3 Americans rely on these sources for drinking water.”

encourages the use of green infrastructure to protect water quality. Specifically, the final rule states:

(2) The following are not “waters of the United States” even where they otherwise meet the terms of paragraphs (1)(iv) through (viii) of this section.

(vi) Stormwater control features constructed to convey, treat, or store stormwater that are created in dry land.

By using the terms “constructed” “in dry land,” the new rule allows EPA to assert jurisdictional authority over the natural lakes, ponds, wetlands, rivers, and streams while not impacting MS4 elements. This section should help to exclude urban stormwater control measures in most cases, as the rule also stresses in the preamble: “This exclusion responds to numerous commenters who raised concerns that the proposed rule would adversely affect municipalities’ ability to operate and maintain their stormwater systems, and also to address confusion about the state of practice regarding jurisdiction of these features at the time the rule was proposed.”

Existing jurisdictional determinations and permits are valid until they expire. By promoting more consistent and effective implementation of Clean Water Act regulatory programs, the rule sets the stage for permit streamlining during implementation.

Some areas may be challenged

However, questions remain about the rule’s definition of tributaries and when that definition applies to ephemeral or intermittent streams – which would make them jurisdictional. According to EPA, 60% of U.S. stream miles flow only seasonally or after rain, and 1 in 3 Americans rely on these sources for drinking water. According to some environmental attorneys, the tributary definition is the part of the rule most likely to be challenged. Based on the rule, a tributary must possess the physical characteristics of a bed, bank, and an ordinary high water mark as well as evidence of the frequency, duration, and volume of flow characteristic of a tributary. Further, to be considered jurisdictional, tributaries must significantly affect the health of downstream waters. Based on these definitions, tributaries primarily include headwater streams. Erosional features and ditches with intermittent flow specifically are excluded along with ditches draining into wetlands.

The final rule also further defines adjacent open waters and wetlands as jurisdictional if they are within 100 feet of the ordinary high water mark of a jurisdictional water or within the 100-year floodplain and within 1500 feet of the ordinary high water mark of covered waters. Certain isolated waters also could fall under the scope of the Clean Water Act based on both their connectivity and proximity to traditional navigable waters, interstate waters, and territorial seas. A significant nexus determination is based on

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the isolated water's effects on the physical, biological, or chemical integrity of jurisdictional waters, such as through an exchange of pollutants, flow, or organisms. Additionally, scientific analyses assessing connectivity will consider how isolated waters affect the nearest jurisdictional water as a group rather than individually.

That analysis will be informed by EPA's final report published last January, *Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence* (<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=296414>), where it summarized current understanding about the connectivity and mechanisms by which streams and wetlands affect the physical, chemical, and biological integrity of downstream waters. The report serves as the technical backbone of the final Clean Water Rule. Even if an excluded ditch falls within the defined limits of adjacent waters, an exclusion will trump an inclusion, said Ken Kopocis, deputy assistant administrator of EPA's Office of Water, in a recent webcast about the rule.


Other clarifications

In addition to the issue of defining tributaries, EPA and USACE say the Clean Water Rule:

- Protects prairie potholes, Carolina and Delmarva bays, pocosins, western vernal pools in California, and Texas coastal prairie wetlands when they affect downstream waters.
- Focuses on streams, not ditches. The rule limits protection to ditches that are constructed out of streams or function like streams and can carry pollution downstream. Ditches not constructed in streams and that flow only when it rains are not covered.
- Significantly limits the use of case-specific analysis by creating clarity and certainty on protected waters and limiting the number of similarly situated water features. Previously, almost any water could be put through a lengthy case-specific analysis, even if it would not be subject to the Clean Water Act.

- Only protects the types of waters that have historically been covered under the Clean Water Act. It does not regulate most ditches and does not regulate groundwater, shallow subsurface flows, or tile drains. It does not make changes to current policies on irrigation, water transfers, or erosion in a field. The Clean Water Rule addresses the pollution and destruction of waterways, not land use or private property rights.

The Water Environment Federation will continue to follow the developments related to this rule and provide analysis and information.

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Claudio Ternieden is the director of government affairs and **Kristina Twigg** is the associate editor of *World Water: Stormwater Management* at the Water Environment Federation (WEF; Alexandria, Virginia). **Seth Brown**, P.E., is a WEF senior adviser on stormwater issues and is the principal/founder of Storm and Stream Solutions, LLC (Springfield, Virginia).

"The Water Environment Federation will continue to follow the developments related to this rule and provide analysis and information."

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Laboratory

by Ken Burgener

Aquaponics is a concept that you may or may not be familiar with. The term comes from a conjuncture of the words aquaculture (the culture or husbandry of water related organisms) and hydroponics (the culture or husbandry of plants in a soilless system). It's currently a trendy word and concept. The idea is that fish produce waste, a lot of nutrients such as nitrogen and phosphorus are high in these wastes, and that plants can uptake these nutrients and use them beneficially to produce a sellable product, such as lettuce, tomatoes, herb, etc.

This idea is getting a huge amount of traction, because around the world aquacultural facilities are damaging coast lines and inland water ways. These high nutrient producing facilities can put aquaponics facility on the end of the process and eliminate many of the problems associated with the normal culture of aquatic species.

This can also be applied to human wastewater treatment. In this case you would not be using fish waste since the human waste contains plenty of nitrogen and phosphorus for the plants to grow and the plants are now cleaning or treating the water. Therefore, you would be adding the process at some interim process that is convenient and where there is enough space. In cold climates these facilities



would need to be enclosed in a greenhouse or other acceptable structure if you wanted the plants to grow year round.

As we became aware of the changing legal requirements, we decided to do a small scale project, here a North Davis. The site was chosen after most treatment has been applied, but before the addition of chlorine. The first year the aquaponics project was run with rock media, which works great for plants, but is very heavy. It successfully showed that the plants would grow in our waste treatment stream. Only vegetables and herbs were used and the project was not started until late June, 2013. The second year, 2014, a tenth grade Weber School District student named Stephanie Vaughn was chosen and it was

decided that we would work with water hyacinth and water lettuce. These are both used as animal feeds, can be composted and we hypothesized that we could extract usable oil from them.

The theory turned out to be true about the oil, even though we did not have much time to collect oil data. Stephanie Vaughn, as it turns out, qualified for the Intel International Science and Engineering Fair (ISEF) in Pittsburgh, Pennsylvania in June. She was awarded a very special Water Technology award from the King of Saudi Arabia for her efforts. It is interesting that a country with such water issues recognizes the value in a project like this. This technology could help here in America as well.

Thank you SJWP 2015 State Organizers

Dear SJWP 2015 State Organizers,

I wanted to take this opportunity to thank you for your dedication to the SJWP program and to also congratulate all of you for the fine work of choosing your state representatives, and to deliver some wonderful news. The U.S. winner, Perry Alagappan (TX), was named the 2015 SJWP International winner last week in Stockholm, Sweden! Perry was presented the prize by HRH Princess Victoria of Sweden at an elaborate awards ceremony on Tuesday evening. I have included a link to the award presentation http://siwi-mediabub.creo.tv/prizes-and-awards/stockholm-junior-water-prize/2015_

[stockholm_junior_water_prize_winner_announcement](http://siwi-mediabub.creo.tv/prizes-and-awards/stockholm-junior-water-prize/2015_stockholm_junior_water_prize_highlights), and press interview http://siwi-mediabub.creo.tv/prizes-and-awards/stockholm-junior-water-prize/2015_stockholm_junior_water_prize_highlights, both which are definitely worth watching. Perry's award is directly after the Diploma of Excellence award won by Chile in the first link.

On Thursday Perry was invited to attend the Stockholm Water Prize Royal Banquet, where he dined in the presence of King Carl XVI Gustaf and Queen Silvia of Sweden, and had a private audience with the Queen to discuss his project. Needless to say, this was a time-of-his-life event for Perry.

Without your dedication and endless volunteer hours this would not have been possible. So again, thank you for making this program such a huge success, and job well done.



Sincerely,
Stevi Hunt-Cottrell
Water Environment Federation
SJWP U.S. National Organizer
703-684-2454

WEAU Night at Salt Lake Bees

By Sam Grenlie, P.E.

WEAU members got out of the office Friday, July 17th to get together and catch the annual Salt Lake Bees baseball game. We had a great turnout with over 80 WEAU members and guests. The Bees provided a private deck complete with burgers and dogs overlooking 3rd base with seats located right below. Everyone was treated to a good game against the Reno Aces – and during the seventh inning stretch – WEAU held a raffle with over \$1,000 in prizes. All the festivities clocked in for \$10 per person which turned out to be quite the value. Big thanks to the Young Professionals Committee for organizing and running the show!

Hope to see everyone out next year and at future events! Make sure to sign up for the WEAU mailing list by sending an email to membership@weau.org and stay in the loop. WEAU Young Professionals and Students Group (YP's) also have an email newsletter, sign up by emailing yp@weau.org.



Announcement

It's not too late to start thinking about next year's OPERATORS CHALLENGE. To anyone and everyone interested in being on a challenge team whether it's as a complete team or individuals wanting to participate. Start planning now, we can pare people up to form teams. This year we would like to invite managers to participate with a team of their own. This is a great event and we want you to join us.

Questions: Contact Gordon Evans PWO Representative at gordone@jordanbasin.com.

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