SUMMER
2016

The Official Publication of the Water Environment Association of Utah

DIGESTED news

Celebrating 50 Years of Clean Water

2016 WEAU ANNUAL CONFERENCE Recap

Snyderville Basin Water Reclamation District
2800 Homestead Road
Park City, Utah 84098
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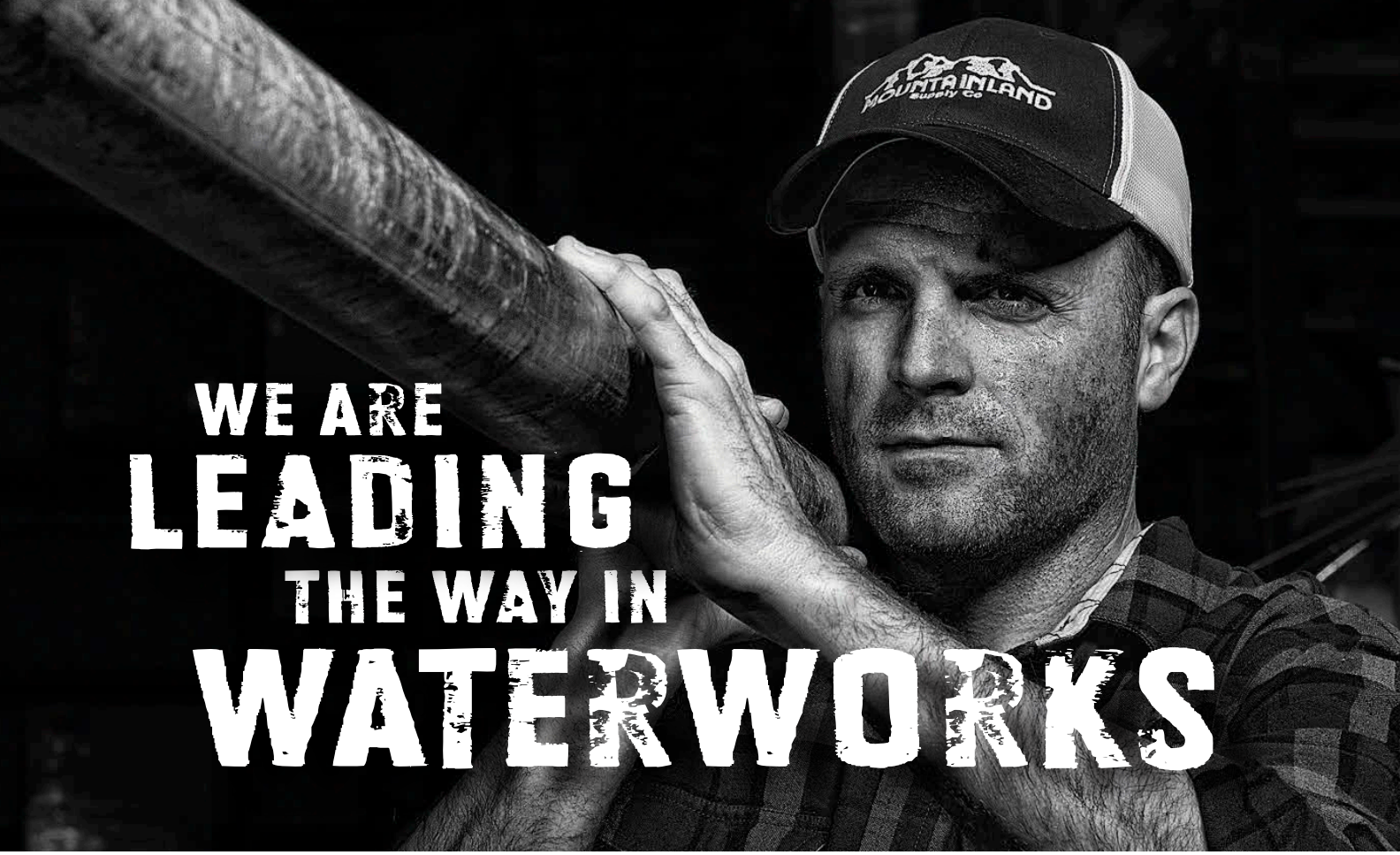

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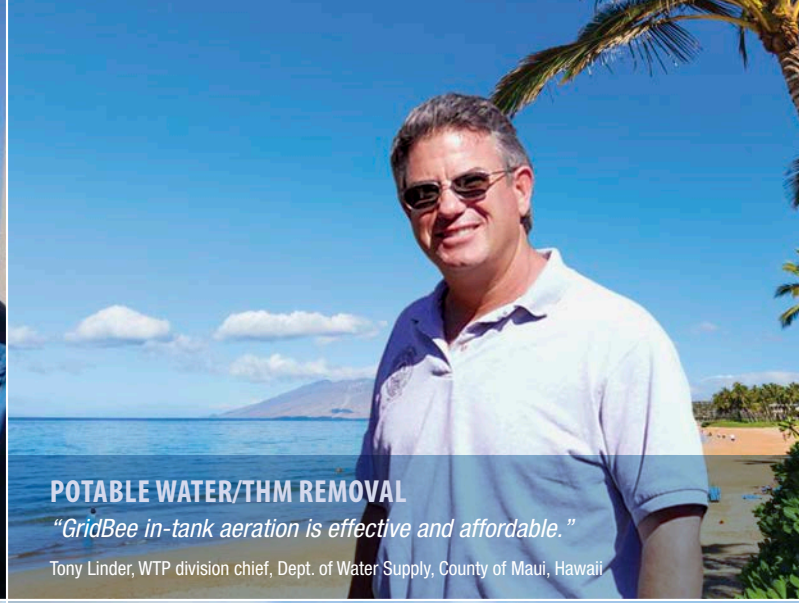
Cary Johnson, water operations mgr., Rochester Public Utilities, Rochester, Minnesota



POTABLE WATER/THM REMOVAL

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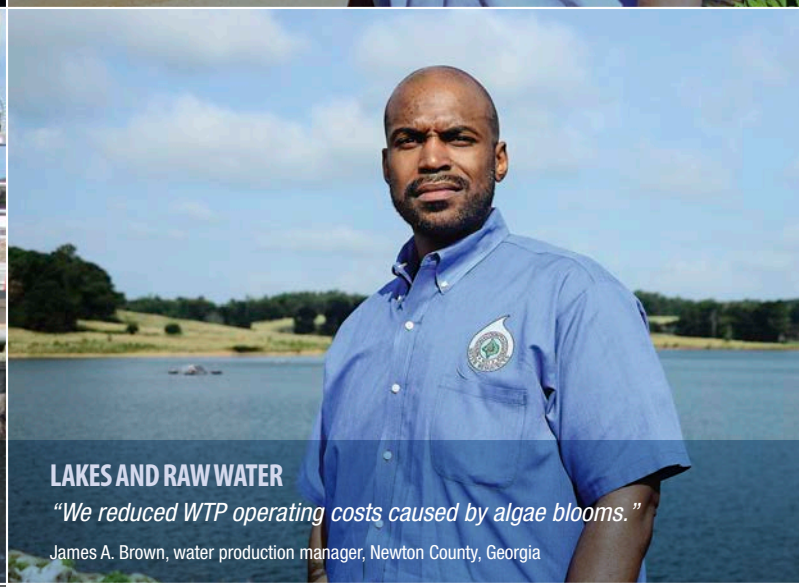
Tony Linder, WTP division chief, Dept. of Water Supply, County of Maui, Hawaii

WASTEWATER MIXING/BASINS AND LAGOONS

"We reduced our nitrate levels and lowered our energy costs."

John Willis, wastewater plant supervisor, Ventura, California



LAKES AND RAW WATER

"We reduced WTP operating costs caused by algae blooms."

James A. Brown, water production manager, Newton County, Georgia

WASTEWATER MIXING/WET WELLS

"Don't let wipes clog your pumps."

Curtis Rooth, foreman, Sewer Dept., Cromwell, Connecticut

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FEATURES

Departments

We are all beneficiaries


Matt Myers

Entropy is sometimes defined as a lack of order or predictability. The universe is said to be at a constant state of increasing entropy, or in other words a gradual decline into disorder, or equilibrium.

I've been thinking about this concept lately. In my simple mind this natural tendency to "decline into disorder" is not just applicable to thermodynamics or the universe in general, but to lots of stuff.

I've watched a local redevelopment where a box store was demolished and removed in a couple of weeks, however the construction of the new building replacing the old one is going to span many months. Same goes for lots of other endeavors. In general, it is much, much easier to tear things down than to build something up. That's just the way it is.

This brings me to the reason I'm talking about entropy. We are all part of a great organization that has been built up by the efforts of all of you great people as well as our predecessors. We are all the benefactors of all that effort.

Let's try to continue building and adding value to WEAU. The natural tendency toward disorder makes trying new things and creating new opportunities for knowledge sharing and interaction in the association difficult, but it is worth the effort.

Because our organization runs on our collective sweat, if you have something that you would like to see happening, make it happen! Contact me or anyone on the board to find out how we can help enact your vision!

Also, because it is easier to tear down than build up, it's important to try to fan the flames of innovation rather than snuff them out. Let's continue supporting each other in our individual efforts.

Finally, I thank you for your work in the association. I am continually impressed by the people that I meet here and am very happy to be a part of WEAU. dn

Matt Myers
President

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Our industry is making great strides

Chad Burrell

It's that time of year when we see students, even our own children, graduating from high school and college and moving on to the next stage of life. I have a daughter that will be in that position next year. She recently had to write an essay on her favorite quote, which ironically was keyed by Jerry Rice. I think this quote should inspire any high school or college graduate to be proud of their accomplishments and jump feet first into what lies ahead. I am including her essay because I think it could also be applied to the work we do in an industry that many choose not to be a part of because we work with "sewage." I feel however, that over the years our industry has made great strides to put new technology, science, and education into something that is now an exciting and thriving line of work.

"Today I will do what others won't, so tomorrow I can accomplish what others can't." Jerry Rice

Essay by Sidney Burrell

I have a lot of favorite quotes. But one of my favorite quotes of all time is the following, "Today I will do what others won't, so tomorrow I can accomplish what others can't." I feel like this quote accurately describes my life for several reasons. I came across this quote when I was going through a hard time in my life and it was able to motivate me to pull through.

I have many examples of this quote being effective in my life. First, this applies to my education. Since my sophomore year in high school I have been working towards my Associates Degree. It has taken a lot of determination and hard work, and even though I won't graduate with my full associates, I will have more than half of it accomplished. By doing this in high school I have been able to save a lot of time and money. It's not a common thing to be working on college in high school and it's not necessarily the popular thing to do, so naturally a lot of students don't enroll in Ednet courses. But I know for a fact that by taking these harder classes I have been able to learn skills that other students my age have not learned yet, and this will put me ahead of the game in many areas.

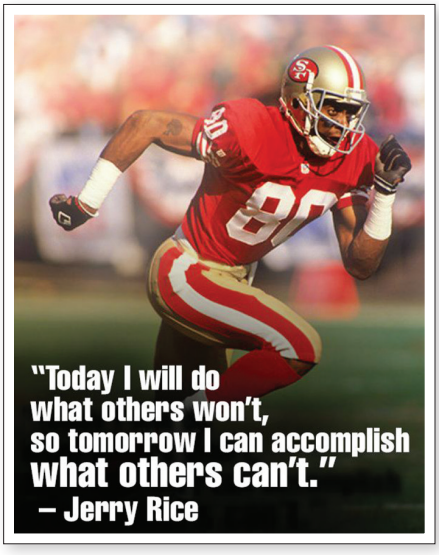
> "I am including her essay because I think it could also be applied to the work we do in an industry that many choose not to be a part of because we work with "sewage."

Sports is yet another category in which I have been able to apply this quote. I love to work out in all aspects of athletics. Although in some sports, the skills don't come easily for me. I absolutely love Basketball, although standing at 4' 11" it is somewhat difficult to keep up in a sport in which height gives a huge advantage. With this disadvantage I am also one of the slower athletes on my high school team. But this fault has only made me stronger, as I have had to push myself harder than any of the other girls. When it comes to the off-season where most of the girls don't even think of Basketball, I'm in the gym almost every day; either lifting, running or shooting. By pushing myself in this aspect I have not only developed a better athletic ability, but I have developed a hard work ethic that distinguishes me from other athletes that are just blessed with talent.

Growing up on a farm has taught me a lot of life skills that will benefit me in the future. Ever since I was a little girl I have had chores to do around the farm, whether I am feeding the animals or weeding the garden, I have had responsibilities. On days that I didn't want to fulfill my responsibilities I didn't have the option to quit. In this sense I had to "Do what others won't do" but in the long run I learned valuable lessons that "others can't have." By having this experience I have been able to build valuable character that others don't have.

In conclusion, I have found that in order to get somewhere in life, effort needs to be put forth. This is the exact point that this quote is trying to illustrate. I've made it a point in my life to; "Today do what others won't, so tomorrow I can accomplish what others can't." DN

Chad Burrell
DN Editor



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APRIL 26-29 | DIXIE CENTER, ST. GEORGE UTAH

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Awards

INDIVIDUAL AWARDS	
WEF Life Members	Rex Ausburn, Bill Luce, Garland Mayne
Grant K. Borg Award	Ken Burgener
WEF Quarter Century Operators Club	Brian Harris
WEF Delegate Service Award	Michael Luers 2012-2015
Laboratory Analyst Excellence Award	Anthony Daw
William D. Hatfield Award	Marlo Davis
Arthur Sydney Bedell Award	Lonn Rasmussen
SSSSS Select Society of Sanitary Sludge Shovelers	Gordon Evans, Jordan Basin WRF Trevor Lindley, Brown and Caldwell Jeff Beckman, Bowen, Collins and Assoc. Giles Demke, SLCWRF Dan Griffin, Utah DWQ

FACILITY AWARDS	
2015 Outstanding Biosolids Program	Orem Water Reclamation Facility
2015 Outstanding Collections System (Over 5 MGD)	North Davis Sewer District
2015 Outstanding Laboratory	South Valley Sewer District Laboratory
2015 Outstanding Lagoon	Town of Tropic
2015 Outstanding Pretreatment Program	Salt Lake City Pretreatment Program
2015 Outstanding Safety Program	Central Valley Water Reclamation Facility
2015 Outstanding Water Reclamation Facility (Over 5 MGD)	Cedar City Regional Wastewater Treatment Facility
2015 Outstanding Water Reclamation Facility (Under 5 MGD)	Orem Water Reclamation Facility

WEAU Annual Conference 2016 Recap

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2016 WEAU Operations Challenge Results

TEAM NAME	SAFETY			LABORATORY			MAINTENANCE			COLLECTION			PROCESS			FINAL	
	TIME	SCORE	RANK	TIME	SCORE	RANK	TIME	SCORE	RANK	TIME	SCORE	RANK	TIME	SCORE	RANK	SCORE	RANK
North Davis	3.36	100.00	1	9.19	100.00	1	4.48	98.20	2	123.06	94.90	4	-3105.00	100.00	1	493.10	1
Central Valley	5.16	62.69	6	10.38	96.87	3	4.36	100.00	1	210.91	60.00	7	-1775.00	75.48	3	395.05	4
Central Weber	4.08	85.08	4	9.56	99.03	2	4.59	96.54	3	110.23	100.00	1	-2500.00	88.85	2	469.49	2
City of Henderson	5.14	63.11	5	12.46	91.41	5	7.02	60.00	7	120.56	95.90	3	-1300.00	66.73	6	377.14	6
Snyderville Basin	4.03	86.11	3	24.41	60.00	7	5.00	90.38	4	209.32	60.63	6	-935.00	60.00	7	357.12	7
Magna Water	5.29	60.00	7	13.59	88.44	6	5.49	83.01	6	123.09	94.89	5	-1375.00	68.11	4	394.45	5
Cottonwood	3.54	96.27	2	11.34	94.35	4	5.48	83.16	5	115.24	98.01	2	-1315.00	67.00	5	438.79	3

2016 WEAU Operations Challenge Teams

1st

NORTH DAVIS

Tom Anderson (Captain) • Tyler Barfuss • Gordon Call • Dennis Byington

2nd

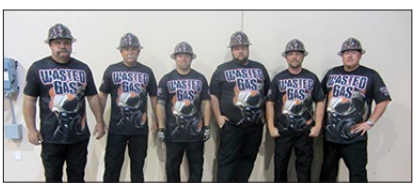
CENTRAL WEBER

Shawn Vockler (Captain) • Kevin Draper • Lee Doxey • Clay Marriott • Shawn Wilson (coach)

3rd

COTTONWOOD

Mike Leonard (Captain) • Scott Brown • Todd Smart • Tony Hale • John Marteliz (Coach)



CENTRAL VALLEY

Josh Hunsaker (Captain) • Mike Earl • Van Bills • James Magill • Shay Green (Coach) • Mitch Desmarais (Coach)

SNYDERVILLE BASIN

Jordan Probst (Captain) • Nick Brown • Dustin Lewis • Dakody Gines • Dustin Walton (Coach)

CITY OF HENDERSON

David McBride (Captain) • Zoltan Revay • James Koloski • Brian Carlson • Rita Smith (Coach)

MAGNA WATER

Rob Jaterka (Captain) • Beau Lamper • Ed Tucker • Scott Beck • Clint Giles (Coach)

Nice work, Teams!

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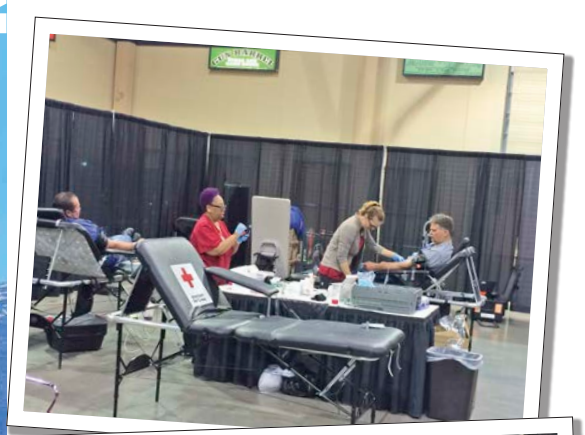

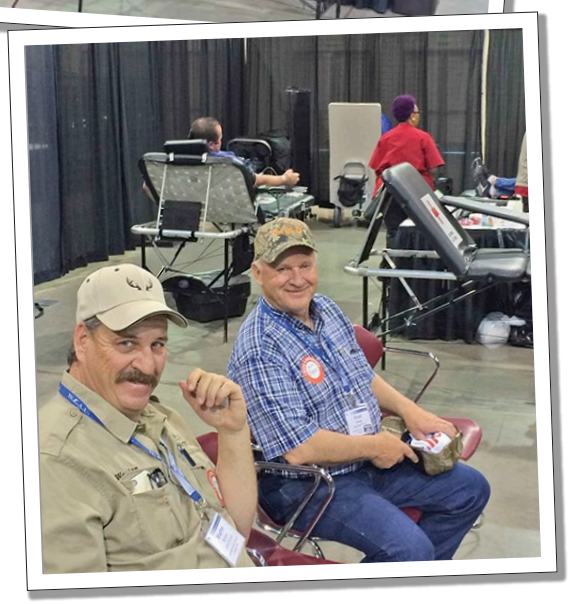

WEAU Young Professional's Recap

By Sam Grenlie, P.E.

WEAU Young Professionals (YPs) turned out in force for the 2016 Annual Conference. The YPs hosted two events: the YP Breakfast and the Red Cross Blood Drive. The YP Breakfast had a great turn out Thursday morning and we were lucky to be joined by WEAU President Phil Heck. The blood drive for the American Red Cross was a total success with the Red Cross Volunteers booked solid throughout the day to collect 22 pints of lifesaving blood. The YPs and the Red Cross sincerely appreciate the great turnout by the community to make the event a success.

The YPs also facilitated donations and an associated raffle for a fundraiser for Water For People. We were able to raise $200, with an additional donation from the organization. Water For People exists to promote the development of high quality drinking water and sanitation services, accessible to all, and sustained by strong communities, businesses, and governments. Water For People is a great cause and fits well with WEAU values, thanks everyone for the support!

If you'd like to get involved WEAU Young Professionals and Students Group (YPs) have an email newsletter, sign up by emailing *yp@weau.org*.

> *"The blood drive for the American Red Cross was a total success with the Red Cross Volunteers booked solid throughout the day to collect 22 pints of lifesaving blood.*

Spotlight on Jeremy Deppe

by Jared O'Brien

This quarter's spotlight is about Jeremy Deppe. Jeremy works at Central Valley Water Reclamation. Jeremy started at Central Valley in January of 2001. He was hired as an operator trainee. Jeremy worked hard on passing the certification exams, and eventually passing the grade IV certification. With that being said Jeremy worked his way through ranks and became a grade IV DRC operator. He worked in operations for thirteen years, then transferred to the maintenance department as a coordinator. Jeremy coordinates all of Central Valley's scheduled and unscheduled maintenance as well as purchasing and vendor consulting. This is a very demanding job and Jeremy is excellent at what he does.

Some of you may know Jeremy as an ops challenge competitor. Or this year's maintenance event head judge. Jeremy has competed on Central Valley's Wasted Gas team multiple times at the annual conference as well as WEFTEC.

Jeremy was born and raised here in the Salt Lake valley, and currently lives in West Jordan. He graduated from Cottonwood High School with the class of 1998. Jeremy enjoys spending time with his wife Camille and his two sons. Jeremy and his family are known for vacationing in southern California visiting Disneyland, amusement parks and the beaches. DN

Operators Quiz

By Sharon Burton

1. **What is the detention time of a stabilization pond that is 4.5 feet deep and covers 17 acres if it receives a flow of .785 MGD?**
   a. 17 days
   b. 32 days
   c. 1.9 days
   d. 25 days

2. **Calculate the water horsepower for a pump delivering 875 gpm against 118 feet of head.**
   a. 101 HP
   b. 55 HP
   c. 7 HP
   d. 26 HP

3. **Chemicals typically used to control filamentous bulking include _____.**
   a. Alum, chloride, and anhydrous ammonia
   b. Alum, chlorine, and ferric chloride
   c. Alum, ferric chloride, and lime
   d. Alum, ferric chloride, and trisodium phosphate

4. **When performing a BOD5 test, the sample is incubated at _____ for 5 days.**
   a. 15 degrees C
   b. 20 degrees C
   c. 25 degrees C
   d. 30 degrees C

5. **Bulking sludge or foaming problems could indicate the presence of _____.**
   a. Filamentous organisms
   b. Stalked ciliates
   c. Rotifers
   d. Worms

6. **Two types of samples typically taken for an activated sludge process are classified as _____.**
   a. Grab and certified
   b. Grab and compound
   c. Grab and composite
   d. Grab and continuous

7. **To prevent biological and chemical alteration of samples, _____ is required.**
   a. Proper Sample Preservation
   b. Refrigeration to reduce biological activity
   c. Regular Cleaning of all sampling devices
   d. All of the above

8. **Enclosed, Open, and Semi-closed are terms used for the designation and selection of_____.**
   a. Impellers
   b. Lantern rings
   c. Sleeves
   d. Stuffing boxes

9. **When working in a confined spaced where flammable gases may be present, use only tools made of:**
   a. Stainless steel
   b. Lead
   c. Iron
   d. A non-sparking allow

10. **If the efficiency of a clarifier is 55% and the TSS influent to the clarifier is 280 mg/L, what is the TSS effluent from the clarifier?**
    a. 126 mg/L
    b. 154 mg/L
    c. 55 mg/L
    d. 111 mg/L dn

ANSWERS: 1)B 2)D 3)B 4)B 5)A 6)C 7)D 8)A 9)D 10)A

PWO Message

By Rob Jaterka

It was another great year for the sewer Olympics (ops challenge). Seven teams competed for the coveted toilet lid trophy. Six teams from Utah: Cottonwood, Central Valley, Central Weber, North Davis, Magna Water, and Snyderville. The seventh team came from The City of Henderson in Nevada. We're all glad they traveled north to compete with all of us. North Davis took home the gold with a first place finish in: safety, lab, and process. Central Weber took the silver with a first place finish in collections and second in: lab and process. Cottonwood took home the bronze. This year process was done a little different than in the past. Teams were split between the written test and a simulator on a computer. I myself did not do the simulator but heard it was not as easy as some believed it would be. Over all things work out pretty good. Competing is only part of the fun of this event. Practicing with other teams and the little rivalries that develop are the real fun. The competing even continues when we all arrive at Fiesta Fun. There is one more aspect that I believe needs to be acknowledged. The WEAU board and Marlo Davis for all they do behind the scenes that no one knows about. Thank you guys and gals for all the support. And then we can't forget the people who volunteer to judge these events. My hat goes off to you folks for putting up with us opinionated competitors. Also the employees who stay home to man the fort, and management for allowing us to miss work to be part of this experience. Finally good luck to North Davis and the Wasatch Allstars in New Orleans. dn

> "Practicing with other teams and the little rivalries that develop are the real fun.

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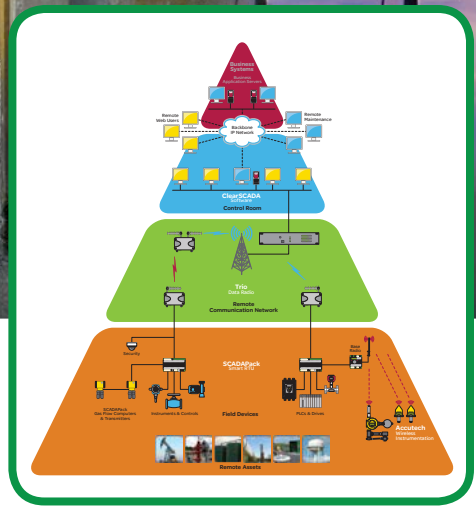

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Collection College News

By Lonn Rasmussen

A big round of applause for Dan Olson, for taking care of the Collection College. Fall classes are coming back to Cottonwood Improvement District. Classes will start on August 24, 2016, and will be held Wednesdays at 12:30 PM. I am working on the final schedule, I will post it on the State Training Calendar and Digested News when I have it complete. Sacramento State came out with a new Volume 1, Operation and Maintenance of Wastewater Collection Systems, 7th Edition. If you are new to the course and need books please purchase the newest volumes 1 and 2. If you are a continuing student keep using the books you have. I am in the process of reading the new manual and updating the class. If I find new information I will pass it along.

There is no cost for the class, but a ream of paper would be appreciated, you will get the paper back in the form of weekly handouts. If you are planning on taking the class please let me know so I can prepare enough handouts for everyone. Please contact me at Cottonwood (801) 943-7671 if I am not available please leave a voice message stating who will be attending and a phone number. I will not sell (unless the price is right) the attendance list, I will only use it to contact students if there is a change to the schedule. As you journey through the sewers of life may your slope always be downhill and a 2'/sec flow at your back. DN

Safety Quiz

Sponsored by the WEAU Collection Committee

1. **What are the signs of Heat Stroke, and how should it be treated?**
2. **Name two other heat related conditions other than Heat Stroke?**
3. **When and how often should you apply sunscreen?**
4. **What do sports drinks like Gatorade replenish?**
5. **Why do you need to replace electrolytes in the body?**
6. **Is a suntan a sign of good healthy skin?**
7. **A person has pale or bluish skin color, cold skin and dull eyes or sunken eyes. These are symptoms of which medical emergency?**
8. **What should you put on a first degree burn?**
9. **One of the best ways to protect yourself from the suns damaging effects is to?**
10. **If blood is squirting from a wound what should you do?**

ANSWERS:

1. High body temperature, altered mental state, nausea/vomiting, flush skin, rapid breathing, racing heart rate and headache. Call 911, move the victim to an air conditioned environment, remove unnecessary clothes, put ice packs under in the arm pits, groin and back of the neck.
2. Heat Cramps and Heat Exhaustion.
3. 20 minutes before sun exposure then every 40 to 80 minutes there after, 20 minutes if exposed to water or sweat.
4. Electrolytes.
5. Electrolytes allow the cells to generate energy and move fluids within the body.
6. No, it's a sign of damage to the skin.
7. Shock, even if the victims injuries are not life threatening, the person can go into shock. and die. Shock occurs when internal organs and tissues don't get enough blood and oxygen. Call 911, elevate the legs one foot off the ground, maintain an open airway and control bleeding.
8. Cool water.
9. Cover up when out in the sun, wear a large brim hat, sunglasses that offer UV protection from UVA and UVB rays, put on sunscreen where you cant cover the skin.
10. Avoid contact with blood by using disposable gloves; cover the wound with a clean cloth and apply continuous pressure.

Pretreatment Workshop Update 2016

By Sarah Leavitt

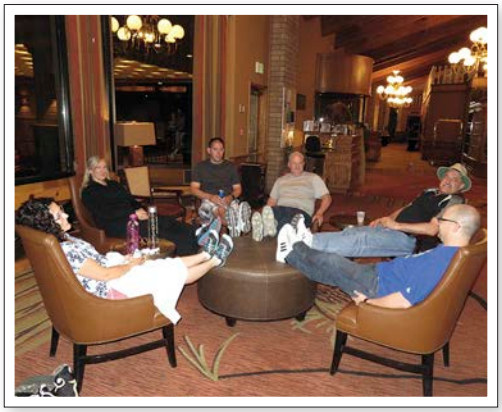
The Region 8 Pretreatment Association Workshop was held in Durango, Colorado this year. Utah was well represented and Spence Parkinson did a great job as the R8PA Chair. There were a lot of great topics covered by a variety of speakers, some of which were from Utah as well.

We learned about the history of Durango and points of interests we might want to go see from Durango's Mayor. Al Garcia, from EPA, gave an update about Shale Gas Extraction and how EPA is trying to push for no discharge from Shale Gas Extractions to POTWs. EPA is considering opening the Metal Finishing Regs, there are different feeling about this one. Dental Amalgam Rule was discussed again, we keep hoping it will just go away, but unfortunately, it looks like it will become a rule, stay tuned for more details. Electronic Reporting for DMR is required by all POTWs by December 31, 2016, if you don't already use NetDMR, you need to get ready for it. After you get used to it, it is a pretty simple program to use. We learned about the Naturally Occurring Radioactive Materials in the environment, just to let you know, Utah has high levels of radiation. Curt McCormick gave a great presentation about how a permit is a shield. Jason Watterson from the Trust came and talked about Pretreatment Safety and Lee Rawlings discussed ProUCI Software.

Wednesday we had three break-out sessions. Attendees had the opportunity to discuss local limits with Paul Krauth, Pretreatment 101 with Jeff MacFarlane and Adam Butterfield or FOG/Inspections where Chad Burrell and DeLaun Fullmer taught part of the session.

Thursday we listened to Teresa Gray from Salt Lake County Health Department who talked about ways to have environmental partnerships between agencies; she had some really good stories to tell. Becky Haugen from BioLynceus discussed flushables, there was some entertaining conversations over this topic, especially over the "Shittens" commercial, if you haven't seen it, take a look, it will make you laugh. Lee Rawlings also talked to us about choosing a laboratory and the things we need to consider. Trace Workman did a great job discussing grease in the collection system and proper screening. Jen Robinson discussed categorical standards and documents that are available to us. Paul Krauth was the concluding presenter on the coming septage crisis. It was a great workshop. dn

> "There were a lot of great topics covered by a variety of speakers, some of which were from Utah as well.



A New Pretreatment Committee Chair

By Sarah Leavitt

I have to admit when I received the news that I won a Director position on the WEAU Board I was surprised. I appreciate the vote of confidence the WEAU members have given me to serve them on the board. It has been a bitter sweet moment. I have been involved with the Pretreatment Committee for almost as long as I have been doing Pretreatment. I have enjoyed my time spent with these amazing people either in meetings or trainings. It has been a good experience servicing as the Chair for the past three years as well. But, now, it is time for me to pass on the mantel to Brett Nelson from Central Weber. Brett will do a great job as the Pretreatment Committee Chair and will have the support of a fantastic committee and group.

Tailgate safety

By Curt Simmons, WEAU Safety Committee

One of the greatest obstacles that any wastewater treatment facility faces is trying to sell the idea to look at and recognize the hazards in every task we are assigned. You would think that folks would be on the lookout for hazards just so they won't cause themselves pain. By itself, this would seem to be the only reason that anyone would need in order to work safely and not take chances. The truth is people don't believe that they **will** get hurt, they gamble with their lives and health regularly, or they just don't think about the hazards hidden in the tasks they are performing and cannot see the risk involved… until it's too late!

The problem with most safety programs is the employee buy-in… anyone would have a hard time selling what the employee doesn't believe in. The trick is to convince the average wastewater worker to believe that they are vulnerable and the task they are asked to do could cause them harm, and then convince them to work safely to avoid getting hurt, not because of safety rules but because it's the right thing to do. This is not an isolated attitude by a few employees, but a problem that we all share. One of the many great things about being part of a WEAU committee is the ability to network with other facilities. This gives us the opportunity to see how others are working, how others are overcoming problems, etc. It also allows us to see that we all suffer from the same ailments. This buy-in and hazard awareness are some of those.

> "A short 5-10 minute talk holds the employees attention, doesn't bore them to tears, and gives employees an opportunity to discuss the things that they are involved in, knowledge and hazard awareness concerning the tasks they are working on.

What to do? While there are more ideas out there that address this issue than I can talk about here, in my humble opinion the following are the three best ways to help combat this problem:

1. **Knowledge** – Learn about the hazards and track and recognize them
2. **Training** – Train employees on how to avoid the hazards and how to perform the work
3. **Repetition** – Talk about the hazards again and again

At North Davis one of the ways we try to accomplish this by providing weekly Tailgate Safety Meetings. These short discussions are more comparable to a mini training session. We talk about awareness issues, compliance and hazards. This helps keep our employees thinking of the hazards present and their personal safety. Each department, Lab, Collections, and Operations/ Maintenance, gets a different topic based on the needs or current tasks in which they are involved with. These short sessions will bring up questions and discussions that hopefully stay in the minds of our employees. We conduct these meetings in their own department at a time that is convenient at the beginning of their shift, with little interference with the work day and most importantly, we try to keep them short.

Tailgate Safety Meetings are not a substitute for regular safety training because they do not go into the details needed for proper training. A short 5-10 minute talk holds the employees attention, doesn't bore them to tears, and gives employees an opportunity to discuss the things that they are involved in, knowledge and hazard awareness concerning the tasks they are working on in real time.

There are many different things needed to alleviate the problems encountered running a successful safety program. Though this is only one small facet of the work that needs to be done, Tailgate Safety Meetings could be just one tool that can help to make a difference. Try this at your facility and I think you will see it does help to keep safety in the minds of the employee. It's a small investment for a big return. dn

WHAT'S THE VALUE OF WATER?

Splashing in a pool, tossing a water balloon—water is one of life's great pleasures.

Most of us never think about how water gets to us or where it goes when it swirls down the drain. Luckily, we don't have to. Pumps, treatment plants, and pipes bring us clean water and remove wastewater.

But our water systems are aging. They need investment so they can continue to deliver life's most precious resource. All day, every day.

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Presented in cooperation with the Value of Water coalition

Grand Island Investment

in HeadCell® Low Maintenance Cost Grit Removal

As a critical part of a $21.5 million upgrade to its wastewater treatment facilities, the City of Grand Island, Nebraska, has invested in an advanced grit removal system for high-performance grit removal from the wastewater treatment plant (WWTP) headworks.

DESIGNING FOR built-in redundancy and achieving grit particle removal performance down to 90 microns were important factors in designing the optimum solution for the plant operators, replacing aging and inefficient equipment. An Advanced Grit Management™ solution from Hydro International was selected and proved its capability with challenging first-flush conditions experienced within days of being commissioned.

"The existing wastewater infrastructure at Grand Island was around 50 years old," said Dr. Jue Zhao, PE, WWTP Operations Engineer, City of Grand Island. "The City had many issues with treatment plant and equipment, and we were faced with a growing population and rising flow volumes. As a consequence, the City decided to invest $21.5 million, including construction and consulting service, over a five year WWTP refurbishment project built to meet our future needs."

A key section of the WWTP headworks, the pre-treatment grit removal facilities were undersized and performing poorly. During peak flow events, grit was being flushed through the aerated grit chambers into the adjacent primary clarifiers and depositing there. As part of the overall wastewater treatment utilities upgrade and based on discussions with the City, engineer Black & Veatch selected Hydro International's HeadCell® grit removal technology, with Hydro grit washing and

Hydro International®

collection equipment, to remove grit down to 90 microns ensuring reliable and effective protection to downstream treatment equipment and processes.

"We were first approached in 2012 to conduct a study to consider the wastewater handling and treatment needs of the City well into the 21st century, taking account of matching population growth and regulation changes," commented Nathan White, PE, Black & Veatch Engineering Manager. "This resulted in recommendations for upgrading the major sanitary interceptor sewers, as well as the main treatment plant."

GRIT REMOVAL TECHNOLOGY COMPARISON

"Grit removal at the headworks was one of the priority areas. A major concern in any treatment plant is to provide continuous treatment through redundancy and the existing plant with its grit basins was inadequate; indeed much of the equipment such as valves and pumps were corroded and barely functioning, so a complete replacement was required.

"We evaluated two alternative types of grit removal to meet the new maximum 40 mgd (million gallons per day) flow capacity, a mechanical vortex based design and Hydro's HeadCell® / SlurryCup® / Grit Snail® treatment train. The specification for each of the two treatment technologies was to have a grit removal plant that removed 95% of grit down to 90 microns at the average design flow of 13 mgd per treatment train, and 95% grit down to 150 microns at max peak hourly flow capacity per treatment train of 30 mgd.

"Overall capital and installation costs were very similar. In consultation with the City's Public Works engineers we made a visit to a nearby plant at Lincoln, Nebraska already using HeadCell® treatment technology. The City engineers were impressed with the collected grit quality, and we went with the Hydro design because of its high grit removal performance combined with low mechanical equipment needs which offer much less maintenance costs in the future."

REPLANNING TIRED DESIGN

Grand Island, the fourth largest city in Nebraska with over 50,000 inhabitants, sits on the Platte River, which flows east out of Colorado and Wyoming into the Missouri at the Iowa border. The water table is high, and pumping is necessary to maintain flow in pipelines and across the treatment plant.

The plains topography is comprised of low, rolling hills and the soil is wind-blown and silty / sandy in composition, which inevitably ends up being washed by surface water drainage into the sewers and the treatment plant. As well as domestic and city sewage, the industrial wastewater includes a major meat processing plant, with all waters treated by the WWTP before discharge to the Platte through the Wood River.

The existing plant was sized for 35 mgd hydraulic capacity, but its age meant that its capacity was restricted to around 27 mgd. Although the original 1965 grit treatment building structure was in good condition, the equipment and facilities such as the Parshall flume for flow measurement were in poor condition and undersized, the

bar screens required replacement and the wet well concrete at the base of the building was in need of repair. Additionally, the existing facilities had no provisions for odor control. Hydrogen sulfide gas accumulates in the long, level pipe runs characteristic of the topography and must be handled.

HEADCELL® REDUNDANCY PLAN

"As a result of all these factors, the project team decided to start with the new headworks facilities consisting of pre-treatment and a grit removal building," commented Nathan White. "There was sufficient building space to achieve the ideal configuration for a plant with parallel treatment trains, providing the redundancy capacity we desired. This made the planning, construction and installation of the equipment very straightforward."

Black & Veatch worked in depth with the Hydro team on the design, to optimize the layout with each treatment train as a true mirror image of the other. After the initial mechanical bar screening, the set up on each side is comprised of a 12 ft. HeadCell® unit with 10 separation trays and a dedicated pump.

The treatment is completed by SlurryCup® grit washing and classification and Grit Snail® dewatering units, which dewater the grit for disposal at not less than 60% total solids and a maximum organics content of 15%. A dedicated control panel serves each and allows full automation and integration with the WWTP SCADA system for remote monitoring and control, including automatic start-up when incoming flows exceed set capacities.

"After grit treatment, the wastewater exits via the primary clarifiers and flow distribution structure to downstream processes including activated sludge process and digestion," added Nathan White. "Achieving a linear series of pipe runs, especially in the inflow to the HeadCell® units, has allowed us to reduce turbulent flow, maximize flow rates and possible settlement of suspended particles, and thus minimize any maintenance requirements in the pipework and downstream equipment including abrasion damage."

COPING WITH EXTREME GRIT LOADS

The built-in redundancy is designed to maximize the City's return on the investment in the pre-treatment and grit removal facilities, which has an anticipated design life of 50 years. Predicted peak day flows of 25 mgd per treatment train are well within the plant design capacity with 20% of additional capacity. It is anticipated that only hourly peak flows would reach the equivalent of the 60 mgd capacity when both treatment trains would be engaged; 99% of the time only one treatment train would be required to be operational.

Construction started in July 2013, the new plant was put into commission in early March 2015, running with ground water to test the equipment, then with an initial loading from the sewers to fully test the new pumping station in parallel with the old equipment. After just two days, the grit removal system was put under an extreme test due to the very tight construction schedule, and came through with excellent results.

Nathan White explained: "The replacement North Intercept sewer had been completed a year before and the old pipeline was due to be taken out of service. We took the decision to divert the sewer through the new grit removal plant as the commissioning had proved problem-free.

"A year's worth of construction trash, sediment, grease and grit was washed through with the raw sewage and the Hydro equipment coped with the influx without any problems. It was possibly the worst conditions the plant will face and we ran both treatment trains for a considerable time to catch the accumulated material.

"While we have not made any comparative survey of the rates of grit removal, before and after, we are continuing to optimize the plant, with a great deal of helpful service from the Hydro team. Regular site visits and reports from site operatives have shown that grit removal is much improved from before and the equipment maintains its efficient performance."

Dr. Jue Zhao confirmed the progress with HeadCell®: "I worked in consultancy before I joined the City project team, in 2012, and have prior experience with HeadCell®. The grit removal is already performing much better than previously, with some fine tuning ongoing with Hydro's help."

For further information email *wastewaterinquiry@hydro-int.com*, visit *www.advancedgritmanagement.com* or *www.hydro-int.com* or call (503) 615 8130.

HYDRO INTERNATIONAL which has offices in the UK, USA, Singapore, China and Ireland is a global leader in sustainable technologies for the control and treatment of stormwater and wastewater. For more than 30 years, Hydro has been at the forefront of water industry innovation and product development. From housing developments and municipal sewage works to paper mills and public highways, thousands of Hydro products are operating in countries all over the world. With strong bases in both the United States and the United Kingdom, and a network of partners and agents, Hydro is strategically placed to deliver winning technological solutions to customers wherever they are in the world. DN

Intermittent Operation - an irresistible attraction?

Operating wastewater treatment plant processes or equipment intermittently offers the irresistible attraction of reduced energy costs. But take the practice too far, or in the wrong circumstances, and treatment processes can be damaged as a result. Marcia Sherony, National Sales Manager of Hydro International, looks at the trend to introduce intermittent plant operation in some processes in waste water treatment. Using grit removal as an example, she considers the opportunities and pitfalls.

Hydro International®

THE COST OF ENERGY is a constant consideration on the operating budget of plant operators. Public facilities that treat and distribute drinking water and those that collect and treat wastewater are energy-intensive, accounting for approximately three percent of U.S. electricity use (approximately 100 billion kWh annually).[1]

For local governments, this level of consumption means that water and wastewater facilities are one of the largest and most energy intensive loads they own and operate, representing up to 35 percent of municipal energy use. Wastewater facilities in particular have a wide variety of processes and associated equipment that consume energy.

The equipment and processes used in treatment plant operation, and the amount of energy they use, vary significantly reflecting the regional topography and environmental conditions and requirements to treat certain types or concentrations of waste.

LOOKING FOR SAVINGS IN ENERGY USAGE

Any plant operator tasked with auditing wastewater processes to isolate the biggest energy consumers and identify operational efficiencies faces conflicting priorities. Both operators and engineering designers are motivated firstly by maintaining or improving the availability and reliability of their facilities. Any energy-efficiency opportunities have to be considered within this context.

[1] *EPRI, Water and Wastewater Industries: Characteristics and Energy Management Opportunities, 1996.)*

A waste treatment plant engineer knows that motors and motor-driven equipment use a significant amount of energy to pump, filter, and aerate water. Indeed, wastewater aeration, pumping and solids processing account for a significant amount of the electricity used in wastewater treatment. Approximately 42,000 wastewater pumping stations across the country operate to meet continuous and varying wastewater flows and typically, pumps are the most prominent energy consumers.

However, each piece of equipment is part of an integrated system. Therefore, it is important to consider facility performance when introducing energy-efficiency measures and to determine which measure or combination of measures will result in the biggest energy reduction for a given investment, and avoid degradation in performance.

Frequent targets of cost-cutting audits are pumps and the subsequent activated sludge treatment process. Both processes can be energy-intensive in many plants. For example in a typical activated sludge treatment plant, the aeration system typically represents 60 percent of a plant's electricity use; pumping represents an additional 15 percent, of which grit slurry pumping is a small part.

"While plants should continue to reduce electricity consumption where possible, balancing the system performance efficiency and operation of any other downstream treatment processes must also be considered."

GRIT SYSTEM CONSIDERATIONS

It's tempting to think that diurnal flow variations and wet versus dry weather variations in incoming waste water flow volumes might be met with intermittent grit pumping schedules. While plants should continue to reduce electricity consumption where possible, balancing the system performance efficiency and operation of any other downstream treatment processes must also be considered. The loss of digester performance and aeration basin efficiency, along with the time and expense to clean either, can quickly offset any savings realized by running the grit pump intermittently.

As there are no industry guidelines available for intermittent running of grit pumps, careful and continuous attention to flow and incoming grit load is required and intermittent operation is often not suited to many plants and locations for a variety of considerations including flows, collection system design, condition of the collection system, and grit loading

Continuous grit pumping is recommended in many applications to ensure that elevated grit loads and wet weather events are covered when higher grit volumes can be expected. It is also important that total solids in pumped grit slurry remains at approximately 1 percent or below, otherwise washing and dewatering equipment efficiency can degrade and risk plugging, as can piping.

Where conditions allow, it is possible to consider intermittent pump operation, which should always be assessed by an expert. For example, it could be used if the range between the peak and average flow is very great, (i.e. high wet weather flow spikes) or there are very low overnight incoming flows with small grit loadings such as may occur at small plants. However, the entire grit system must be designed to handle the build-up of grit which will occur with intermittent operation.

When operating the grit system intermittently, it is advisable that continuous operation is still enabled during wet weather events. This can be achieved either by influent flow sensing triggered by a set point for automatically switching between continuous and intermittent operation, or a manual control switch with timed intervals during dry weather and continuous during wet. The latter carries a certain risk if not well attended.

High-performance grit separation system can be optimized for intermittent flows. In the latest developments of the Eutek HeadCell® for example, an expanded grit underflow collector allows grit to

inventory while the pump is not operating. Flexible grit pump operation can be optimized by plant operations personnel based on grit load and plant demand while minimizing energy consumption. Intermittent pump operation can also reduce plant use of Non-Potable Water associated with the grit washing / dewatering system components as these components typically run in tandem with the grit pump.

DESIGN IMPLICATIONS

In other grit collection technologies, energy usage is dependent on the process design as well as the operating equipment. For example, aerated grit basins can be a significant source of power consumption due to the blowers used to supply air to diffusers located in the basin. Aeration basins typically have a recommended air delivery rate of three to eight cfm of basin length, where the basin length is the standard three to eight times its width, and designed for a detention time of three minutes at peak flow. This means that a typical basin of 55 ft length, and a width of 7 ft to 18ft, could require 165 to 440 cfm of air, and need up to 100HP of power to drive the air compressor. There are, of course, far bigger basins which require more air and higher power to produce it.

The next power user in a grit system is typically the grit pump and any potential saving through intermittent operation would be attractive. However, will intermittent pump operation impact the grit- or other subsequent processes? Combined sewer plants and plants with large peak to average flow ratios will see a significant increase in grit load at higher flows.

Grit quantities are typically reported to range from 0.53-24 ft^3/mgal (M&E) and operating grit pumps intermittently during high influent loadings can be detrimental to the grit removal process and cause plugging, loss of grit and system failure. Pumping intermittently increases the concentration of the grit slurry as well as the problematic debris accumulated in the grit sump and grit slurry piping.

In fact, even without intermittent pump operation, the lack of sound design guidance may contribute to the problems met in removing, conveying, and processing grit slurry at many treatment facilities; combined sewer collection systems are particularly prone. It is ironic that this process is intended to prevent or reduce downstream maintenance, but often is fraught with its own frequent maintenance issues such as plugged grit slurry collection sumps, plugged grit slurry piping, failed grit slurry pumps, and plugged grit slurry concentrators. Intermittent operation will only exacerbate such problems.

CAREFUL CONCLUSION

While decisions to run equipment like pumps, including grit pumps, intermittently can save electricity and lower energy costs, care must be taken to match the operating schedule to plant inflow conditions. Careful assessment, and the right grit removal equipment, will greatly reduce the risks of extra costs incurred through ineffective removal using conventional technologies or intermittently pumping decisions influenced solely by the desire to cut the dollars.

Consulting closely with engineering designers and equipment manufacturers is therefore essential to take advantage of the opportunities of intermittent operation without running unnecessary risks. DN

By **Caroline Dale** and **Barry Liner**. Caroline Dale is a principal engineer of biological processes at the Cary, N.C., office of Veolia Water Technologies (Paris). Barry Liner is the director of the Water Science and Engineering Center at the Water Environment Federation (Alexandria, Va.).

Selenium removal using a moving bed biofilm reactor

Selenium is a naturally occurring and essential nutrient for humans, animals, and some plants; however, selenium also can cause adverse health and reproductive effects when consumed in excess. In nature, selenium is found primarily in organic-rich sedimentary rocks (e.g., petroleum source rock, coal, phosphorites, and carbonaceous shales) and sulfidic ores. Because of its natural occurrence in geologic materials used as industrial feedstocks, selenium often is present in wastewater due to oil and gas extraction, petroleum refining, coal-fired electric power generation, metals mining and processing, and production of phosphate fertilizers. It also is found in wastewater and sludge at wastewater treatment plants. Selenium also may be present in irrigation water and stormwater runoff from agricultural operations located in areas with seleniferous soils.

In mining and coal-fired power plant effluents, selenium is mainly found in the form of selenate (Se [VI]) and selenite, (Se [IV]). Both compounds are toxic to aquatic life; hence, discharge limitations for selenium are becoming increasingly stringent. The U.S. Environmental Protection Agency (EPA) requires selenium concentrations in discharges from coal-fired power stations to be below 12 ppb on a monthly average and 23 ppb as daily maximum. The discharge consent for release into freshwater systems at certain sites is 5 ppb.

Treating selenium

Selenium treatment technologies can be applied either at the source (upstream) or at the end of the pipe (downstream), or both. The species of selenium can change as wastewater moves through different chemical, physical, and biological processes within the facility's treatment plant or process units. The applicable treatment technology required will depend on the species of selenium in the wastewater and discharge requirements.

Selenate and selenite can be reduced biologically to the elemental form of selenium, which makes it virtually insoluble. Particulate elemental selenium can then be separated from the wastewater by traditional liquid–solid separation methods. Biological treatment methods include constructed wetlands and fixed-film bioreactors – using granulated activated carbon as support material for biofilm growth, either as a packed bed or as a fluidized bed – and moving bed biofilm reactors (MBBRs) utilizing a plastic support for biological growth.

Other methods include precipitation with iron salts, ion exchange, zero valent iron, and reverse osmosis.

Although technologies are capable of removing selenium from industrial wastewater, the ability to consistently and reliably remove selenium remains a challenge. Treatment of selenium using these core technologies will require primary, tertiary, and residuals treatment. The effectiveness of selenium treatment is highly dependent on species, concentration, and mass of selenium in wastewater and other water matrix parameters. Therefore, a detailed wastewater characterization including selenium speciation and mass balance would be important to properly evaluate treatment options. An example of this evaluation based on utilizing an MBBR process on both power plant and mining effluent is provided below.

MBBR technology

An MBBR is a biological method to remove selenium that can operate with the same support material for over 20 years, while granulated activated carbon in other biological methods may need to be replaced regularly. The MBBR does not require back-washing; it can tolerate high suspended solids concentrations in the feed and is not subject to clogging. MBBRs also are generally energy-efficient, and individual reactors can be made significantly larger than other bioreactors.

The MBBR process has been used extensively for carbon and nitrogen removal. The process utilizes media made of polyethylene, which has a shape that provides a large protected surface area for biofilm development. Two examples of MBBR media are shown in Figure 1. K1 is the original media with a protected surface area for biofilm growth of 500 m^2/m^3 at 100% filling (bulk volume/volume). K5 is a later development that provides 800 m^2/m^3 at 100% filling. Fillings up to 60% to 65 % can be used. Under anoxic conditions, the media are kept in suspension using mechanical mixers.

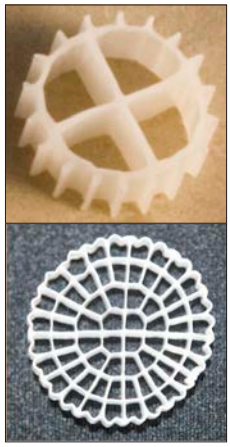

Figure 1. Examples of MBBR media: K1 (top) and K5 (bottom). (Credit: Veolia Solutions and Technologies)

Performance evaluation

Studies were performed on laboratory MBBR models that were continuously fed with industrial wastewater from two sources: flue gas desulfurization (FGD) from a power plant and a coal mine. Carbon sources and nutrients were added in small separate feed streams. Effluent samples were collected and treated in batches with either filtration through 0.2-μm membrane filters or with coagulation and flocculation using ferric chloride and polymer.

The characteristics of the wastewaters treated are summarized in the table.

FGD effluent

Treatment of the FGD effluent containing approximately 250 ppb selenate and 90 ppm NO_3-N was studied in a two-stage MBBR with K1 media. Glucose was added as carbon source and the process was operated at 30°C.

Parameter	FGD effluent	Coal mine effluent	Copper mine effluent
Selenate (ppb)	237	-	469
Selenite (ppb)	<5	-	9.5
Total Selenium (ppb)	249	38	560
NO_3-N (ppm)	90	23	1.5
NO_2-N (ppm)	0.7	0.02	0.015
Sulphate (ppm)	2000	420	240
COD (ppm)	105	<10	<10
PO_4-P (ppm)	0.11	0.03	0.03
NH_4-N (ppm)	3.3	<0.015	<0.015

Table. Influent characteristics of the tested wastewaters

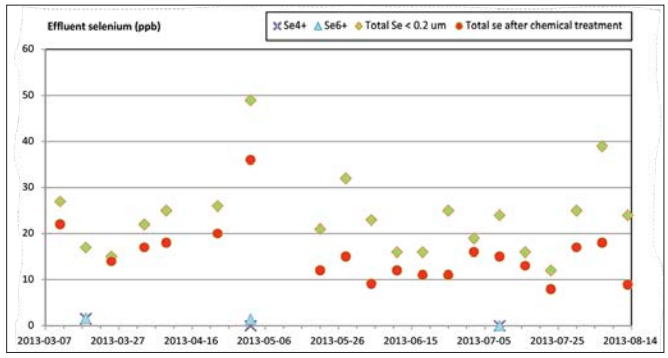

Figure 2. Effluent concentrations of selenium when treating FGD wastewater

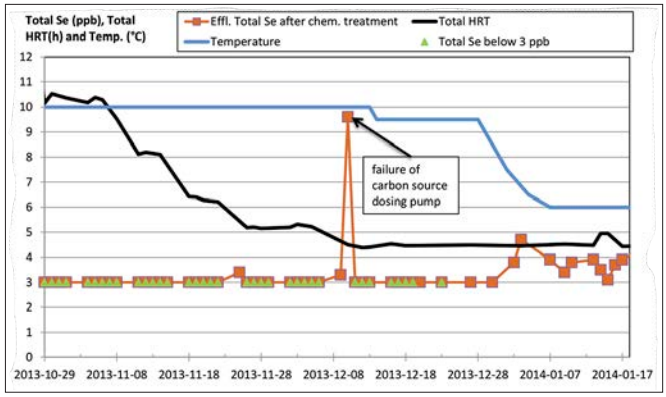

Figure 3. Total HRT, process temperature, and effluent concentrations of total selenium in coal mine effluent (green triangles represent samples that were below the detection limit, 3 ppb, for total selenium)

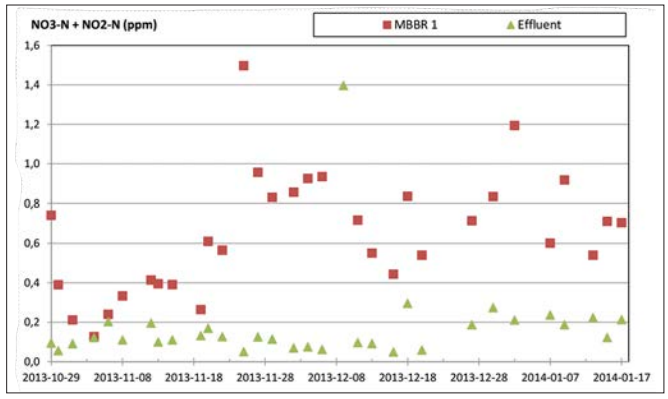

Figure 4. Concentrations of NO_3-N + NO_2-N in MBBR 1 and in effluent for coal mine wastewater

The results (Figure 2) show that it was possible to achieve 10–20 ppb of total selenium after chemical treatment. The total selenium concentrations after chemical treatment were consistently lower than that of the filtered samples, which demonstrates that chemical treatment was more efficient than filtration through a 0.2-μm filter for separation of selenium from the effluent.

NO_3-N and NO_2-N were depleted in the first MBBR, while most of the selenium removal took place in the second reactor.

Coal mine effluent

Treatment of coal mine effluent containing approximately 38 ppb total selenium and 23 ppm NO_3-N was studied in another two-stage MBBR using K5 media and Micro C as a carbon source. The process temperature was decreased gradually from 22°C to 6°C during the study, and the total hydraulic retention time was decreased from 30 to 4.5 hours.

The results (Figure 3) show that it was possible to consistently achieve concentrations of less than 5 ppb total selenium after chemical treatment and frequently below the detection limit of 3 ppb. The concentration of NO_3-N+ NO_2-N was reduced to 0.4 to 1.2 ppm after the first reactor and then further reduced to around 0.2 ppm after the second (Figure 4). Between 50% and 85% of the selenium reduction also occurred in the first reactor, with the second reactor acting mainly as a polishing step for both nitrate and selenium.

A viable treatment option

The results show that MBBR can be a viable solution for biological selenium removal as well as nitrate removal from FGD and mine effluents. By combining the MBBR with traditional chemical treatment, very low effluent selenium concentrations can be reached. With so much focus on the selenium regulations, having a biological solution offers treatment options where they were previously limited, especially in the mining and energy markets.

Note: This article was adapted from a WEFTEC 2014 presentation, "Moving Bed Biofilm Reactor for Selenium Removal from FGD and Mine Effluents," by Caroline Dale, Maria Ekenberg, Mikael Sjölin, Flemming Wessman, and Jens Morän.

Caroline Dale is a principal engineer of biological processes at the Cary, N.C., office of Veolia Water Technologies (Paris). **Barry Liner** is the director of the Water Science and Engineering Center at the Water Environment Federation (Alexandria, Va.).

Press Release: BlueTech Forum

Delegates enjoy the presentations at BlueTech Forum.

Oasys Water, a specialist in forward osmosis and zero liquid discharge is one of 12 technology companies sharing their innovative applications with delegates at BlueTech Forum.

NASA chief scientist joins BlueTech Forum event

- Delegates will hear about future water technology landscape
- Opportunity to engage with market sector experts
- Twelve leading innovative companies will present case studies

Dennis Bushnell is chief scientist at one of NASA's key research centres in Hampton, Virginia, USA.

A keynote address from NASA chief scientist Dennis Bushnell will be one of the highlights at BlueTech Forum, which is being held in the US city of San Francisco on 1st June 2016. The high level event also features presentations by 12 of the water industry's most innovative technology companies and roundtable briefings hosted by market sector experts.

BlueTech Research chief executive Paul O'Callaghan said, "The theme of this year's BlueTech Forum – insights to future-proof your water strategy – has captured the imagination of delegates.

"Innovators are the future of water and we have hand-picked exciting technology companies that represent the widest possible spectrum of water technology innovation. Delegates will enjoy very practical presentations of case studies showing how these technologies are already working and are ready for much wider application."

Glen Daigger, Professor of Engineering Practice at the University of Michigan and a consultant for O2 Environmental TAG will be hosting a water technology round table on nutrient recovery, one of twelve BlueTech Forum briefings.

He said, "If you want to make a difference in terms of getting new ideas into routine use, there is a whole body of knowledge that you need and getting engaged with a group like this is one of the best ways to learn."

Investors attending BlueTech Forum, a BlueTech Research event, will hear about the kinds of technologies they need to future-proof their technology portfolios. The technology companies presenting case studies on the day include:

- Fathom Water - smart water and internet of things technology for water utility applications
- Spiral Water – macro-filtration case study for the food and beverage sector
- Oasys Water - forward osmosis technology for zero liquid discharge in power and oil and gas
- Organica Water – decentralized aesthetic wastewater treatment and water reuse
- Water Planet - ceramic membranes
- OptiRTC – predictive analytics for stormwater management
- Apana - predictive analytics for commercial water management
- Pasteurization Technology Group - municipal wastewater treatment
- Nanospun - microbial encapsulation
- Hitachi Pegasus technology - Seawater Desalination and Sewage Treatment Integrated System
- Xylem – Oxelia system for drinking water

Attendees will also learn how macro drivers link with the technologies profiled to create market opportunities. They will also find out how to identify the best thematic areas for strategic investment and acquisition.

For more information and to register for BlueTech Forum, please visit www.bluetechforum.com.

About BlueTech Research

BlueTech® Research provides investors, water companies, researchers and regulators with the latest information at their fingertips. The company provides clarity and critical analysis on emerging water technology market areas.

BlueTech Research maps and analyses the water technology innovation landscape. The company is focused on what is changing and how new approaches, new technologies and new needs are reshaping the water technology market. *www.bluetechresearch.com.* DN

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