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The Official Publication of the Water Environment Association of Utah

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*(ABOUT WASTEWATER OPERATORS)*

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**INSIDE:**

2023 Engineering Symposium Recap | WEAU's 2023 Mid-Year Conference



## Discover the Cost-Effective Difference ACO Stormbrixx Makes For You.



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Sherry Sheffield

# All Drains Lead to the Ocean

**A** lot of people believe that all drains really do lead to the ocean. Thanks Disney! I like Finding Nemo but it drives me crazy how Hollywood just glosses over what really happens to the water and wastes that go down our drains (I'm looking at you Flushed Away and The Secret Life of Pets). Maybe you could argue that due to the water cycle, all drains do lead to the ocean – eventually – but I'm not buying it. We in the wastewater field know better. We know that while some drains may lead to the ocean, most lead to septic systems or wastewater treatment plants. Even most effluent doesn't end up going to the ocean, so sorry, Nemo, the drain is not a good way for you to get home.

Unfortunately, the average person believes these half-truths hook, line, and sinker. Unless they've had a sewer backup or a problem with their septic system, most people don't even think about what happens when they flush the toilet, wash their clothes, or use the garbage disposal. Maybe there is a magic fairy that waves her wand and the wastes disappear and the fresh, clean water goes straight to the idyllic ocean. Can you say "Pooph?" I can't be too disappointed in the gullibility of the average Joe, however, since I used to believe that way too before I started working in the industry and learned the truth.

Wastewater treatment, while it might be stinky and gross at times, is truly amazing. Think of everything that our facilities take out of the water – diamond rings, snakes, deodorant, eggshells, ammonia, food, poo, and much, much more. Using mechanical, biological, and chemical means, we can take a pretty major waste and reclaim it for beneficial use. That's quite a bit better than your average



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## President's Message

recycling plant. Of course, as the understanding and definition of wastes and the corresponding regulations continue to increase, the operation of our facilities becomes ever more complex – and expensive.

As members of the wastewater community in Utah, I believe we have a responsibility to educate as many people as we can about where their poo really goes. We need to teach them about the amazing technologies and skills our facilities and operators utilize. We need to help them understand the incredible service we are performing and the costs associated with wastewater treatment.

As members of WEAU, we have the opportunity to do just that. We have started a new Public Outreach Committee with the mission to get the word out to the public about the importance of wastewater treatment, how wastewater is treated, and why it is worthwhile to invest in wastewater facilities and employees. We are hoping to attend watershed symposiums and community events to

spread the word and we need your help. If you would like to volunteer to man one of the booths or have other ideas for educating the public about wastewater treatment, please email me at [ssbeffield@swwater.com](mailto:ssbeffield@swwater.com). We are open to any and all suggestions.

It isn't easy to work in a field that not only isn't appreciated, but is often the butt of jokes. When I tell people where I work, their first reaction is rarely complimentary. When you ask a child or a teen what they want to be when they grow up, wastewater worker is never high on the list – if it's even on the list at all. But what we do is essential. We need to lead the charge in convincing people that wastewater treatment is important and working in wastewater is a noble and valid career. The only way to do that is by helping people understand that all drains DO NOT lead to the ocean. So, the next time you make a new acquaintance, I dare you to ask them, "Do you know where your poo goes?" 

“ We need to lead the charge in convincing people that wastewater treatment is important and working in wastewater is a noble and valid career.

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# Swiss Lightning

Bryan Mansell



A few months ago, I was fortunate enough to travel with my parents and siblings to Europe for my parents' 50th anniversary. At the end of the family trip, my brother and I and our spouses spent a couple days in Zermatt, Switzerland so we could see and hopefully hike in the Alps.

The day we arrived we rode the Gornergrat (an old cogwheel train) up the mountain to get a good view of the Matterhorn and the surrounding glaciers. The weather was questionable, but we felt prepared and not worried. Upon arrival, we walked around the area and enjoyed the views, even meeting their local Ibex up close. As we checked out the astonishing blueish glaciers, it started to rain hard, so we broke out our jackets and an umbrella. Amusing ourselves for a while and not hearing (or at least not noticing) any thunder, we took our time walking around the area.

Eventually, we started making our way slowly back to the train. All the sudden, the four of us were stunned and confused by the crash of thunder that sounded around us. We all felt electricity go through us and several saw light on the ground at their feet. I was the idiot carrying the umbrella and felt the jolt through my arm and one of my legs. It was like crossing a wire during a home project, but stronger. After a few seconds, we looked at each other (all of us miraculously still conscious and apparently unharmed) and started running for cover. We tried to go in a service door of the hotel so we could remain inside but were denied. So, without another choice, we ran through the rain from one place of cover to the next, hearts pounding with fear, until we reached the train.

We hadn't planned on ending our visit to Gornergrat so abruptly but did not feel safe being outside anymore. Once we

“ We're still not exactly sure what type of lightning phenomenon we experienced, but it was terrifying.

## “ Suddenly something that used to not bother me because it seemed impossibly unlikely, feels much more likely.

sat down, we looked at each other with wide eyes and exchanged phrases like, “Holy crap!” and “What just happened?!” As the train made its way down the mountain, our nerves still tingling, we tried to determine how we were still alive and what exactly had taken place. We looked up lightning facts and types of lightning strikes. I was surprised at how many ways it can happen and learned terms like side flash, ground currents, streamers, etc. It turns out they can all be deadly, but we got lucky.

We're still not exactly sure what type of lightning phenomenon we experienced, but it was terrifying. I also have to admit that it's given me some PTSD that has surfaced in more recent thunderstorms. Suddenly something that used to not bother me because it seemed impossibly unlikely, feels much more likely.

Since we all want to learn from our experiences and because knowledge is power, I've been learning more about lightning and how to protect ourselves from it. Here are some facts from the National Oceanic and Atmospheric Administration (NOAA) and Weather.gov:

- Around the world, there are about 6,000 lightning strikes every minute.
- Lightning can be five miles long and have 1 billion Joules of energy (almost 280 kWh or about 3.3M AED shocks).
- Lightning is hotter than the surface of the sun, reaching temperatures of 50,000°F.

- According to NOAA, lightning is one of the MOST UNDERRATED weather hazards.
- Each year in the US, lightning kills 20-30 people on average and injures hundreds more.
- A tree is **not** a safe place to take shelter during a thunderstorm.
- Crouching down will **not** reduce your risk during a lightning storm. It's better to quickly keep moving to an actual safe shelter.
- Pavilions, shed, and other small structures are not safe places to shelter during a thunderstorm.
- Lightning can strike as far as 10 miles away from a storm cloud. It's common for lightning to strike from clouds leading and following a thunderstorm. That's why it's important to get indoors before the storm is above you and stay for 30 minutes after the storm has left.
- Lightning can and often does strike the same place more than once. The Empire State Building is hit about 25 times per year.
- The CDC's Slogan for lightning safety is “When thunders roars, go indoors!”

Hopefully, this gives healthy respect for lightning, clears up some common myths and helps you protect yourself, your loved ones, and your coworkers and friends from lightning injury. [Dn](#)

## FIND THE HIDDEN GOLDEN SLUDGE SHOVEL!\*

Each quarter, *Digested News* has this golden sludge shovel icon hidden somewhere in the content of its pages.

**Be the first to find it and email the editor** ([digestednews@weau.org](mailto:digestednews@weau.org)) the correct page number to **win a \$25 Amazon Gift Card.**

Emails should include:

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Winners will be notified directly and named in the next issue of *Digested News*.

\*For those of you new to WEAU, volunteers who give notable time and service to WEAU are awarded a “5S” golden lapel pin shovel. With that award, they become members of the **Select Society of Sanitary Sludge Shovelers**. WEAU is always looking for volunteers and maybe one day, you too can become a 5S member. [Dn](#)



**CONGRATS TO:  
LAUREN SCHMIDT,  
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# Pretreatment Training Update

By Juliette Curtis, SGRWRF Pretreatment Coordinator, City of St. George

The WEAU Pretreatment Training held on Wednesday, August 23 was comprised of approximately 45 wastewater professionals. The seven-hour training opened with a Fats, Oils, and Grease (FOG) presentation given by Heather Wadman, Principal Engineer for the Public Services Department of Ogden City, UT. Her presentation touched on aspects of building a FOG program and the resources, public outreach, data collection, and finances needed to build a program from the ground up. Heather's presentation was approximately two hours in length and provided valuable information for all levels of Pretreatment professionals.

Following the FOG presentation, the group broke out into four smaller groups to discuss topics of (1) Enforcement Response Plans, (2) Drafting and Implementing a Permit, (3) Pretreatment Audits and Inspections, and (4) Enforcement and Significant Non-Compliance (SNC). The breakout sessions allowed for attendees to have more in-depth conversations in a smaller group setting, where they could ask questions that were specific to their situations. Within the smaller groups, attendees were able to address specific



issues they might face in their own programs while others shared similar instances or offered recommendations for more efficient ways to approach things. All in all, this was a more intimate setting and allowed more of a networking feel. [Dix](#)



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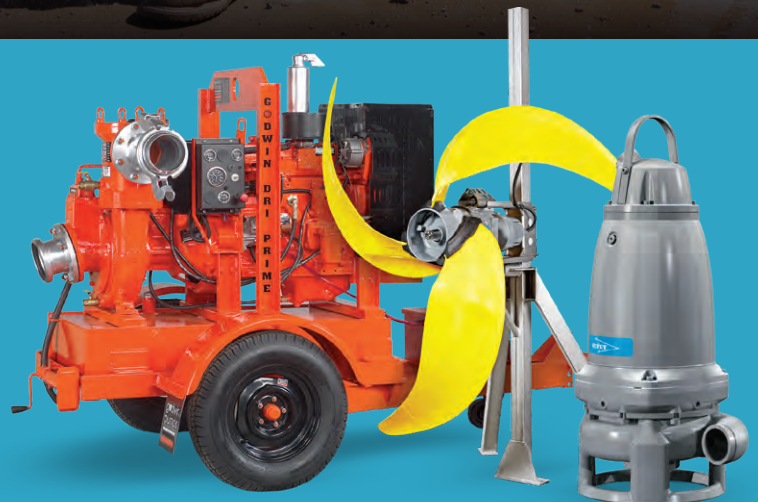
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# Certification Preparation Quiz

By Dan Olson

1. **Rollback occurs when screened material falls back down the face of the screen, possibly being returned to the wastewater flow.**
  - A. True
  - B. False
  
2. **A pond WRRF is most likely to have this type of screen in its headworks.**
  - A. Manual bar screen
  - B. Perforated plate screen
  - C. Stair screen
  - D. Micro screen
  
3. **Match the screen type to its identifying characteristic.**

1. Trash rack	A. Single operating cycle
2. Manual bar screen	B. Interlocking links, no lower sprocket.
3. Single rake screen	C. Efficiently removes hair and stringy material
4. Catenary screen	D. Integrated wash press
5. Continuous self-cleaning screen	E. Remove only largest debris
6. Perforated plate screen	F. Rectangular openings limited in height and width
7. Stair screen	G. May be located in a bypass channel
8. Inclined cylindrical screen	H. Two sets of lamella lift solids up stairs
  
4. **On a single rake screen, a limit switch \_\_\_\_.**
  - A. Sets the upper and lower limits of travel for the rake
  - B. Adjusts input line voltage
  - C. Modifies the minimum particle size captured
  - D. Turns off the drive motor if the rake is jammed
  
5. **One disadvantage of using comminutors and grinders is \_\_\_\_.**
  - A. Reduced potential for clogged pipes and damaged equipment
  - B. Increased screenings disposal costs
  - C. Shredded material reduces treatment capacity downstream
  - D. More frequent overflows of the influent channel
  
6. **A WRRF with a combined sewer system is expecting a large storm. The manual bar screens are normally cleaned every hour. The operator should plan to decrease the cleaning frequency during and immediately after the storm.**
  - A. True
  - B. False
  
7. **A shear pin is designed to break under a certain amount of force or pressure to prevent additional damage to equipment.**
  - A. True
  - B. False
  
8. **Screens should be cleaned before the head loss across the screen reaches \_\_\_\_ or according to the screen manufacturer's recommendations.**
  - A. 2.5 cm ( 1 in.)
  - B. 7.6 cm (3 in.)
  - C. 12.7 cm (5 in.)
  - D. 17.8 cm (7 in.)
  
9. **This type of control mechanism is best suited for storm events or other conditions that produce highly variable amounts of screenable material.**
  - A. Clock timer
  - B. Level sensor
  - C. Particle counter
  - D. HOA switch
  
10. **A mechanical bar screen must be taken out of service for maintenance. Put the following steps in the correct order.**
  - A. Shut down the screen according to the manufacturer's directions.
  - B. Close the upstream (inlet) gate.
  - C. Close the downstream (outlet) gate.
  - D. Wash the screen to remove debris.
  - E. Drain the channel and remove debris
  - F. Lockout and tagout equipment.
  - G. Wash sides of channel and perform final draining of channel.
  
11. **At a minimum, how often should screens be inspected for visible and audible indications of possible malfunctions?**
  - A. Daily
  - B. Weekly
  - C. Monthly
  - D. Quarterly
  
12. **The volume of grit removed for every million gallons of flow received is very consistent from one facility to the next.**
  - A. True
  - B. False
  
13. **As flow velocity through the basin increases, larger, denser particles will pass through to the next process.**
  - A. True
  - B. False
  
14. **All of the following characteristics will influence the settling velocity of a particle EXCEPT \_\_\_\_.**
  - A. Density
  - B. Size
  - C. Color
  - D. Shape

15. Gravity pulls grit particles straight down, but \_\_\_\_\_ pushes them forward toward the outlet of the grit basin:
- Velocity
  - Density
  - Viscosity
  - Conductivity
16. Which of the following particles should settle the fastest through a column of water?
- Corn kernel
  - Coffee grounds
  - Sand
  - Gravel
17. A grit basin has a flow velocity of 0.3 m/s (1 ft/sec) at 9:00 am. As flows increase throughout the day, grit basin performance will be affected in this way.
- The percentage of organic material captured will increase.
  - Grit removal efficiency will decrease.
  - Velocity through the basin will decrease.
  - Air consumption will increase.
18. Velocity is calculated by multiplying the flowrate by the cross-sectional area.
- True
  - False
19. Grit classifiers return organic material to the wastewater flow and remove excess water from the grit.
- True
  - False
20. A WRRF currently has one grit basin in service. The flow velocity through the basin is 0.8 m/s (2.6 ft/sec). How many grit basins should be in service to maintain a flow velocity between 0.24 and 0.3 m/s (0.8 and 1.0 ft/sec)?
- 1
  - 2
  - 3
  - 4
21. Flow-proportional weirs are used in velocity control horizontal flow grit basins for this purpose.
- Produce a constant discharge rate
  - Reduce buildup of grit behind the weir
  - Measure flowrate
  - Maintain a constant velocity
22. In an aerated grit basin, this process control parameter influences which particles will sink and which will continue on to the next process.
- Velocity of the roll pattern
  - Depth of the basin
  - Vortex dimensions
  - Flow-proportional weir setting
23. This type of grit basin may use paddles to maintain the flow circulation pattern.
- Detritus tank
  - Aerated grit basin
  - Vortex grit basin
  - Velocity control
24. An operator must bypass their aerated grit basin for several days while annual maintenance is performed on the diffusers. Which of the following statements is true?
- Airflow should be set to 50% of maximum after basin dewatering.
  - Grit may pass through and cause damage to downstream equipment.
  - The organic loading to downstream processes will increase.
  - Screenings will accumulate in the grit channel.
25. Grit is typically removed from a vortex-type grit basin in this way.
- Manual removal with shovels
  - Chain-and-flight system
  - Screw auger
  - Grit pumps

Answers

Answers: 1-True; 2-A; 3-Match (1 = E, 2 = G, 3 = A, 4 = B, 5 = F, 6 = C, 7 = H, 8 = D); 4-D; 5-C; 6-False (Combined sewers bring both sewage and stormwater to the WRRF. After a storm, expect accumulated debris to be flushed from the collection system and into the WRRF. Cleaning frequency should increase.); 7-True; 8-B; 9-B; 10-B, C, A, F, E, D, G; 11-A; 12-False (The volume of grit removed is highly dependent on the activities in the service area, condition of the collection system, type of collection system, and other factors.); 13-True; 14-C; 15-A; 16-D; 17-B; 18-False (Velocity is calculated by dividing the flowrate by the cross-sectional area. Alternatively, velocity can also be calculated by dividing the distance traveled by time.); 19-True; 20-C (To solve this problem, divide the current velocity by the desired velocity. The current velocity is 0.8 m/s (2.6 ft/sec). The maximum desired velocity is 0.3 m/s (1 ft/sec).  $0.8 \text{ m/s} \div 0.3 = 2.7$  basins in service. The minimum desired velocity is 0.24 m/s (0.8 ft/sec).  $0.8 \text{ m/s} \div 0.24 = 3.3$  basins in service.); 21-D; 22-A; 23-C; 24-B; 25-D



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# A Message from the PWO Committee

By Nate Cloward/James Magill

As many of you are aware, WEFTEC is fast approaching. This year, two teams are competing in the Operations Challenge. They have been working hard to build cohesive routines for all the events, improving in speed and efficiency.

The first team, the Wasatch All-Stars is comprised of Mark Campbell (Central Weber), Jonathan Baranowski (South Valley), Chad Hardinger (Snyderville Basin), Kendall Linton (North Davis), Don Meunrath (Cottonwood).

The second team is from Central Valley Water and includes Brock Thompson (Maintenance), Trey Sandness (Maintenance), Jay Nowell (Electrical), Chad Fryrear (Operations), and Anthony Rizzuto (Operations).

Since the teams last competed at the annual conference in St. George, there has been a minor change in the lab event. Three flasks were added to complete the experiment/testing section of the event. There were no changes to the other events.

Scheduling for WEFTEC will be as follows: Teams will be arriving on Saturday September 30; Sunday the teams will attend team orientation; Monday the teams will do either the process test or the lab event depending on their schedule. They will also attend the Question/Answer session later that day. Tuesday the



Wasatch All-Stars Team



Central Valley Water Reclamation Facility Team

teams will participate in maintenance, safety, and collections events.

We anticipate getting the competition schedule on the WEAU website soon.

We encourage everyone attending WEFTEC to come over, say hello, and cheer on the teams. Can't wait to see you there! [DW](#)

## Operator Spotlight: Richard Whitaker



In the west end of Layton, UT there remains four and a half acres of what used to be a large family farm. Here resides an individual we all need to get to know a little better, Richard Whitaker.

Richard grew up as a farmer and possesses a work ethic likely unmatched by many. He spent years working on a 400-acre onion farm where he met his wife, Leslie. They have been married for 26 years and have five wonderful daughters ranging from 7 to 20 years of age.

Richard currently works for Central Weber Sewer District, where he has six years of experience as both a mechanic and an operator. He spent three of those years over their dewatering facility, transferring his homegrown skills he learned on the farm to completely rebuilding belt presses and other mechanical equipment. He now contributes as a valuable member of the maintenance crew, putting in work throughout all areas of the plant. In addition, he has earned Grade IV Treatment and Grade III Maintenance certifications, as well as a certificate

from the Davis Technical College (Formerly DATC) in Automation Technology.

Richard has competed three times in the WEAU Operations Challenge including a trip to Nationals on the All-Star team. Once again, he has proven his work ethic transcends many, and it appears in all aspects of his life. When he has free time, he enjoys working on old tractors, cars, and trucks on the farm. The PWO Representatives would like to congratulate Richard on his success and look forward to recognizing him more in the future as an outstanding member of our organization. [DW](#)

# Young Professionals Update



In May, fellow young professional, Bethany Burton, gave a virtual presentation on “Biohacking BNR: Getting the Most Out (Literally) of Your Wastewater.”



In July, four teams of WEAU YPs participated in the Seven Canyons Trust’s Water Trivia night at Squatters Brewery.



In June, the young professionals enjoyed a tour of Snyderville Basin Water Reclamation District’s Silver Creek WWTP.



In August, the YPs met at Central Valley WRF to watch Utah’s most experienced Ops Challenge teams practice and ask them questions over lunch.



## SAVE THE DATE! 2023 MID-YEAR YP SUMMIT

The first ever WEAU Mid-Year YP Summit will be held on Tuesday, November 7, 2023 from 5:30 pm to 8:30 pm at the Hyatt Place Hotel in Cottonwood Heights, UT.

The program will include a wastewater technical discussion session for engineers, operators, regulators, contractors, students, and any others interested in the water and wastewater industry in Utah. A leadership development session will follow the technical discussion.

Stay tuned for additional details and a draft program. Mark the date on your calendars! Dinner is included with registration. Registration will open in September and is limited to 50 YPs.

Register early to secure your spot at a can’t miss YP event. [Dn](#)

# Young Professional Spotlight: Maggie Shalvoy

Project Engineer, Hazen and Sawyer



**M**aggie graduated from NC State in 2019 after completing her senior design project on a pump station. After graduation, she immediately went to work for Hazen and Sawyer working as a designer on all things water. Last year, Maggie moved to Utah, transferring to Hazen and Sawyer's Salt Lake City office.

## What is your favorite part of working as a Water Professional?

Being a water professional, I enjoy being part of meaningful and challenging work. I thrive on the opportunity to talk to people about the water industry's treatment processes and systems that ensure clean drinking water and effective treatment of wastewater for our communities. Most people do not understand how their water gets to them or how their toilet water is treated. I love driving past a treatment plant or pump station and talking about what goes into the design and operations of such a plant.

## What do you like most about the work that you do?

I like that I am always learning or gaining a deeper understanding of a topic. Each project has pushed me to learn new processes, equipment, or design standards. When I almost start to feel like an experienced engineer, I find myself having to google or YouTube something, but I enjoy that about this work.

## What are you most proud of in your career so far?

So far, I am most proud of getting my professional engineering license this summer. When I started engineering school, I was not aware that you had to take and pass two additional tests after getting through graduation (which was hard enough). So, I have been looking forward to getting through those and obtaining my license ever since.

## What is one thing people do not know about you that they would be surprised to find out?

People in my life know that I travel frequently, going on numerous flights every year, but I am frantically anxious on each flight. [Dn](#)

“ I enjoy being part of meaningful and challenging work.

## YPS SUPPORTING EWB

Engineers without Borders USA (EWB) is a nonprofit humanitarian organization established to support community-driven development programs worldwide. The Great Salt Lake Professional (GSL) Chapter has recently undertaken a water distribution project in Nyamvumu, Rwanda. A team of five engineers from Utah went to Rwanda to collect site data and understand the water needs of the community. WEAU Young Professionals are fundraising on behalf of EWB-GSL for the construction of this water distribution system during the Mid-Year WEAU Conference. Please stop by our booth to show your support with fund raising opportunities and to learn about ways to be involved. [Dn](#)

NYAMVUMVU, RWANDA NEEDS SAFE WATER

for drinking and other household uses. Currently, it takes more than two hours round-trip for the community to collect water from an unprotected spring down the hill. This not only results in high-prevalence of diseases in the community with associated morbidity and mortality among children, but also affects the productivity of women and girls as they spend most of their time collecting water for domestic use.

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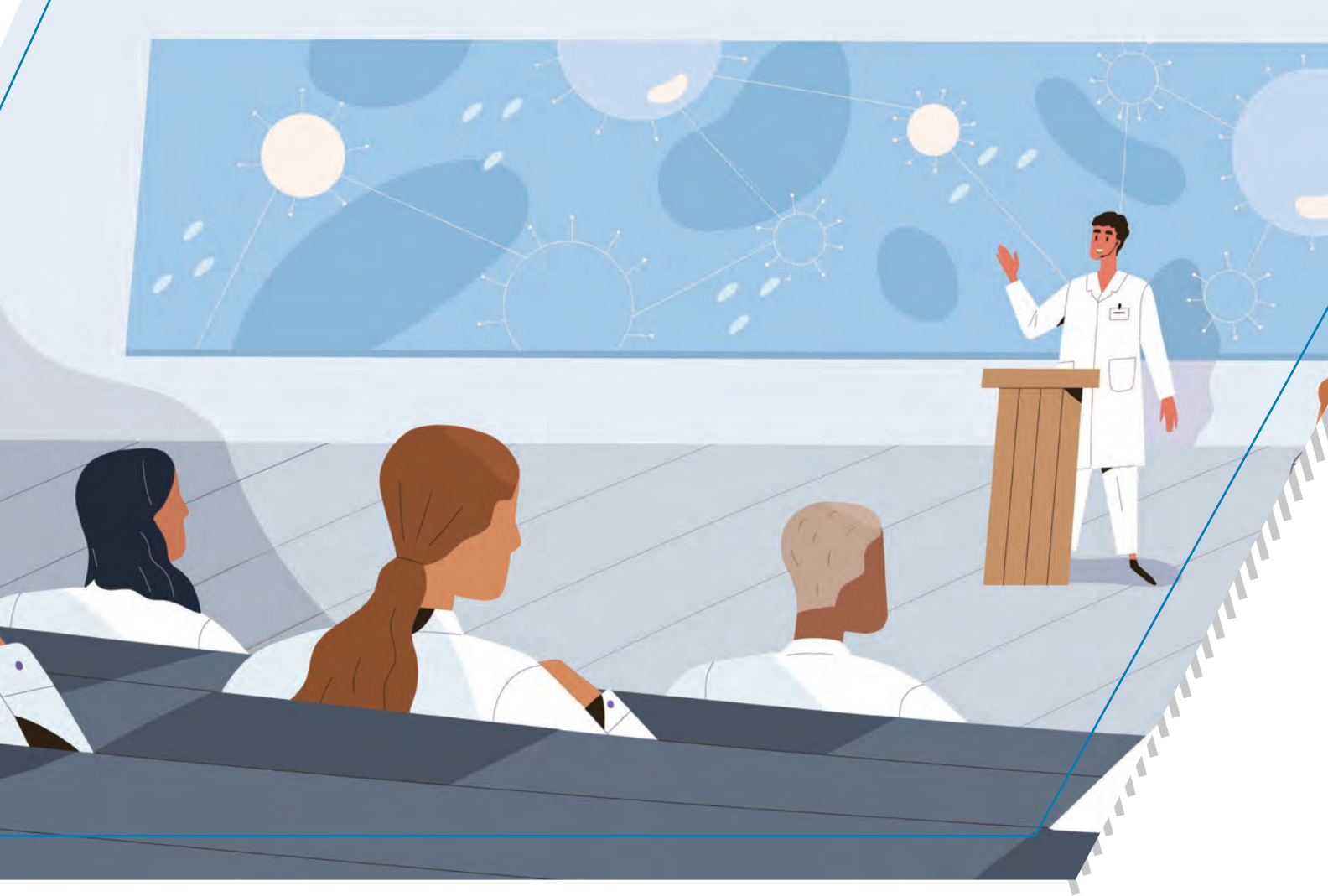
DEC 2025 expected completion

Donate

donate to help us protect the spring source, build a gravity distribution line, and provide access through safe water collection points.

ENGINEERS WITHOUT BORDERS USA Great Salt Lake Professional Chapter

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# 2023 ENGINEERING SYMPOSIUM RECAP

BY JADE ECHARD, STAFF PROFESSIONAL, CAROLLO ENGINEERS

The topic of biosolids brought in a pretty good crowd and discussion at this year's Engineering Symposium. We had five great presentations that discussed the value of municipal biosolids, regulations, and best management options.

## PRESENTATION I

The first speaker of the morning was Michelle Young, PhD a Lead Technologist at Carollo Engineers. She kicked things off with a big regulatory topic in today's water reclamation industry: Per and Polyfluoroalkyl Substances (PFAS). Michelle gave a great

introduction to PFAS, where they come from, how they get in our wastewater systems, how they break down into shorter chain PFAS, and ultimately how of PFAS end up in water reclamation facility biosolids. Michelle has been staying up to date on regulations and what other states,

like Michigan, are doing. She gave us great insight into how the EPA has defined PFAS as a CERCLA-regulated hazardous waste chemical, how they might unveil PFAS regulations in 2024, and what changes Utah wastewater utilities might consider making – particularly when it comes to controlling PFAS at industrial sources.



### PRESENTATION 2

Ryan Dupont, PhD, a professor at Utah State University (USU), discussed personal care products and discussed PFAS, particularly, he discussed studies USU has done on which PFAS levels are measurable in local soils months and even years after biosolids land application. They also analyzed the hay crop grown in areas where biosolids are land-applied and attempted to define levels of PFAS uptake within the crops. Dr. Dupont also discussed other studies USU completed focusing on duckweed and its ability to uptake certain personal care products. He discussed the differences between anaerobically digesting or composting the duckweed and the differences in treatment levels. A master's student, Vickie Krull, presented on her research plans regarding composting biosolids from two different Cache Valley water reclamation facilities and evaluating treatment potential for PFAS.

### PRESENTATION 3

Phil Heck, PhD, PE, the general manager at Central Valley Water Reclamation Facility (CVWRF) summarized how biosolids have been historically managed at CVWRF, presented how biosolids are currently managed, and how the facility intends to manage biosolids in the future. He emphasized adaptation and improvement as a must in effectively managing biosolids. He reviewed CVWRF biosolid upgrades that

are currently being built and others that they intend to construct in the future.

CVWRF is currently in the process of adding both sidestream phosphorus and nitrogen removal, is replacing their gravity belt thickeners for waste activated sludge thickening with centrifuges that provide better dewatering and require no polymer addition, and improving their final dewatering step to include new centrifuges alongside existing belt filter presses to dewater biosolids intended for off-site land application or for onsite composting, respectively. CVWRF's future plans include accepting and digesting high-strength organic food waste to increase biogas production, converting unused and existing digesters to a thermophilic and/or MHP process and preparing their 2,800-acre dry farm located near Fairfield to land apply biosolids.

### PRESENTATION 4

The symposium audience heard from Dave Perry, PhD, PE, who gave a brief discussion on developing biosolid master plans that address multiple goals, including Economics, operations, sustainability, and regulatory. His presentation focused on anaerobic digestion and what upgrades could produce better results. He introduced a process that he's been developing known as Microbial Hydrolysis Process

(MHP) where a thermophilic bacteria, *Caldicellulosiruptor Bescii* (*C. Bescii*), degrades lignocellulose in a post-anaerobic digestion step. This bacterium is active at 75°C, provides additional volatile solids reduction above 75%, and significantly increases biogas production while reducing the amount of biosolids to manage post digestion.

### PRESENTATION 5

Rich Mickelsen, the General Manager at the Timpanogos Special Service District (TSSD) and Brad Rasmussen, PE, from Aqua Engineers, presented on new approaches to manage biosolids at TSSD, including new primary clarifiers, anaerobic digesters, and thermal drying equipment. TSSD historically composted biosolids on site but due to odor complaints, were forced to haul biosolids to landfills. TSSD evaluated several options and ultimately decided to implement primary clarification and anaerobic digestion as their facility continues to expand from its original intended purposes as an extended aeration facility. They would like to beneficially use biosolids and hope to market their thermally dried Class A biosolid to bulk fertilizer wholesalers and help promote more use of biosolids in the local Utah fertilizer market. There was a great discussion about the land application of biosolids considering its value as a fertilizer and the associated risk of PFAS, a hazardous chemical class. [DN](#)

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# 2023 MID-YEAR CONFERENCE

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## REGISTRATION

Keep an eye out for registration information on [www.weau.org](http://www.weau.org).  
A continental breakfast and lunch will be provided as part of the registration.

## MARK YOUR CALENDARS

### WEAU YP SUMMIT

Hyatt Place Salt Lake City/Cottonwood Heights  
November 7, 2023, 5:30-8:30 pm

Watch for more details at [www.weau.org](http://www.weau.org)



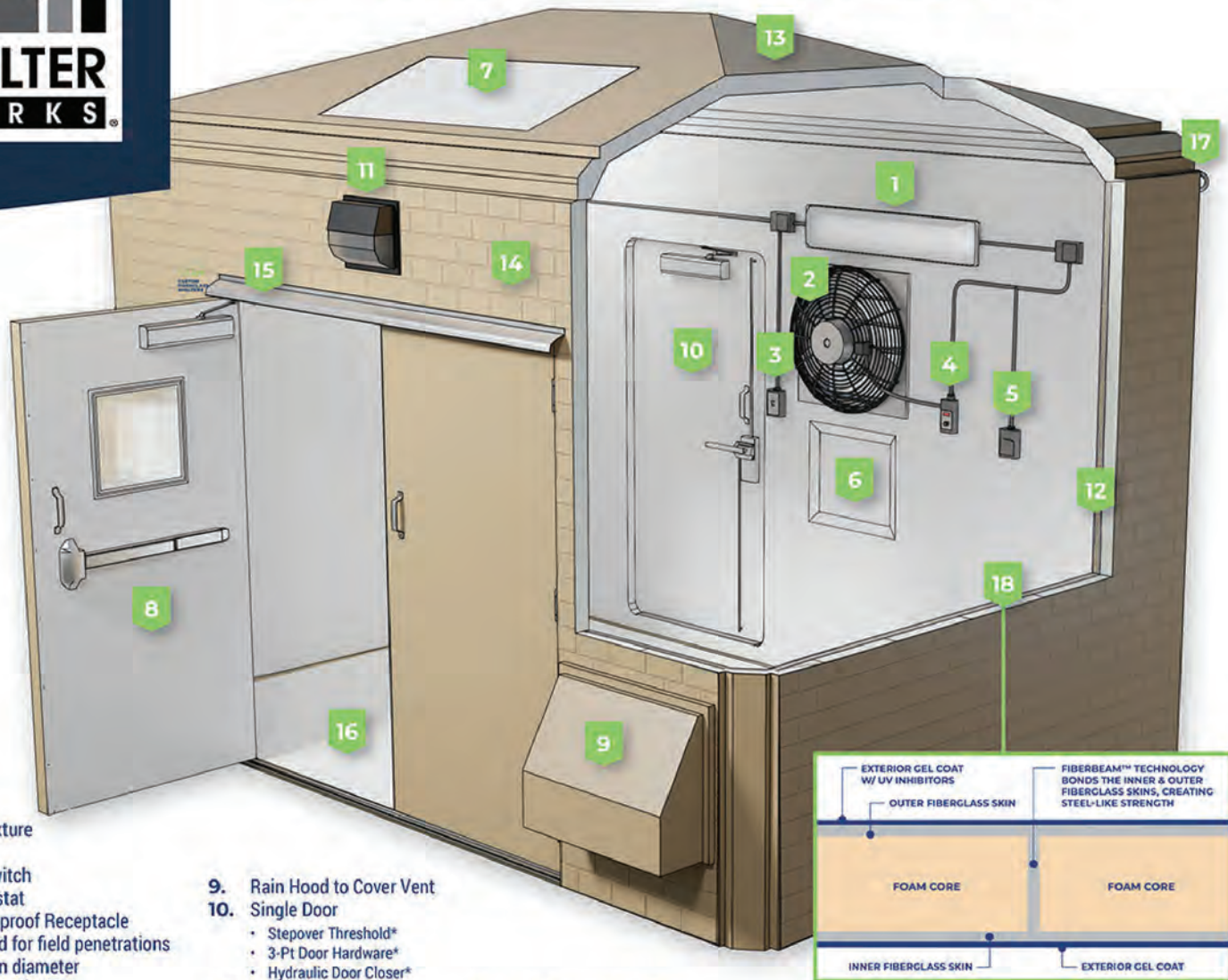
## PRELIMINARY TECHNICAL SESSION LISTING

TIME	PLAZA BALLROOM A	PLAZA BALLROOM B	PLAZA BALLROOM C	SUITE C
8:00-8:30	REGISTRATION AND CONTINENTAL BREAKFAST			
TOPIC	RESIDUALS AND BIOSOLIDS	WATER QUALITY	COLLECTION SYSTEMS	ASSET MANAGEMENT
8:30-9:10	Anaerobic Digestion with Nutrient Control: What if your Digesters Were the Sidestream?	A Need for Lasting Solutions for Utah Lake	Flow Metering 101	Emergency Response Planning in Seismically Active Areas
	Matthew Williams, Thermal Process Systems	Jeff DenBleyker, Jacobs Engineering Group Inc.	Brent Packer, Bowen, Collins & Associates	Brittany Sorenson, Brown and Caldwell
TOPIC	RESIDUALS AND BIOSOLIDS	WATER RECLAMATION AND REUSE	COLLECTION SYSTEMS	ASSET MANAGEMENT
9:20-10:00	Managing Biosolids Along the Wasatch Front: What's Your Plan?	Integrated Water Planning in the Great Salt Lake Basin	Permanent Solutions to Combat Corrosion in Sanitary Sewer Systems	Asset Management Plan for SLC DPU's New WRF
	Randy Zollinger, Carollo Engineers	Laura Vernon, Utah Division of Water Resources	Brandon Tremelling, PE, Geneva Pipe Company (Orem, UT)	Grant Davies, AECOM
10:00-10:20	BREAK			
TOPIC	RESIDUALS AND BIOSOLIDS	WASTEWATER FACILITIES	COLLECTION SYSTEMS	PROJECT DELIVERY
10:20-11:00	JBWRF Thermal Drying: Journey with Condenser Cleans	What Are You Sacrificing?	Adjusting Manholes with Noncorrosive Forms	Insights to Prequalifying Contractors
	Joel Thompson, South Valley Sewer District	Jacob Baer, Carollo Engineers	Josh Surratt, Snyderville Basin Water Reclamation District	Mike Kobe, Brown and Caldwell
TOPIC	RESIDUALS AND BIOSOLIDS	WASTEWATER FACILITIES	COLLECTION SYSTEMS	PROJECT DELIVERY
11:10-11:50	When the Pumping Gets Tough: Overcoming Biosolids Pumping Challenges	Reuse It Up, Wear It Out, Make It Do, Or Do Without: Washington County Regional Reuse Study	Quality Assurance for CIPP Liners: A Team Effort	Water Collaborative Delivery Association: Who We Are
	Ben Custalow, Brown and Caldwell	Clint Rogers, Stantec	Cedar Daniels, Bowen Collins and Associates	Jeremy McVey, Haskell
12:00-1:20	LUNCH			
TOPIC	NUTRIENT REMOVAL	WASTEWATER FACILITIES	SUSTAINABILITY	PROJECT DELIVERY
1:30-2:10	Short-cut Nitrogen Removal Process: Our Experiences with Startup and Operation at CVWRF	All Industries Are Not Created Equal! How Industrial Flows Can Affect Your Municipal WWTP	Save the Planet and Some Money: Reducing Your Energy Usage May Be Easier, Cheaper, and Timelier Than You Think	Challenges of Electrical Construction and How to Adjust for Them
	Dustin Gloor, Central Valley Water Reclamation Facility	Ruby Diaz, Carollo Engineers	Bryan Mansell, Central Valley WRF	Brad Wilding, Skyline Electric Company
TOPIC	NUTRIENT REMOVAL	WASTEWATER FACILITIES	UTILITY MANAGEMENT	PROJECT DELIVERY
2:20-3:00	Rise of the Machines at Clean Water Services WRF: Full-Scale Piloting Experience of Machine Learning Hybrid Nutrient Controller	Microscreening for Advanced Primary Filtration: Pilot Testing at Linda County, CA	Not a Typical Master Plan, Going Digital Makes and Integrated Master Plan More Useful!	Taking Control of Your Design with Equipment Preselection
	Cheng Yang, Jacobs	Bryce Kerney, HUBER	Ben Stanford, Hazen and Sawyer	Tess Laffer, AECOM
3:00-3:20	BREAK			
TOPIC	OPERATIONS	STUDENT PRESENTATION	SAFETY AND SECURITY	PROJECT DELIVERY
3:20-4:00	TBD	TBD	Training Success!	CMGC Early Equipment Procurement Saves Temporary Operations Cost
	TBD	TBD	Jason Watterson, Utah Local Governments Trust	Lane Mullenau, PCL Construction, Inc.

The content of the technical program is subject to change. Visit [www.weau.org](http://www.weau.org) for updates. 



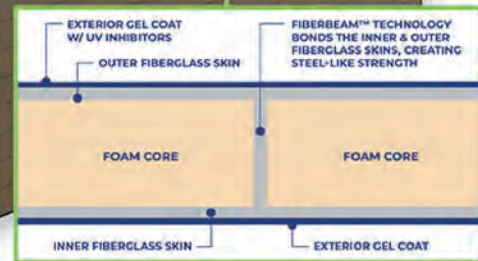
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# 2023 WEAU AWARDS NOMINATIONS

DUE FRIDAY, DECEMBER 15, 2023

## CATEGORIES

### OUTSTANDING PLANT/SYSTEM AWARDS

- Treatment Plant – Under 5 MGD
- Treatment Plant – Over 5 MGD
- Lagoon – Discharging
- Lagoon – Non-Discharging
- Laboratory
- Collections System – Under 5 MGD
- Collections System – Over 5 MGD

### OUTSTANDING PROGRAM AWARDS

- Pretreatment Program
- Biosolids Program
- Safety Program

### OUTSTANDING INDIVIDUALS AWARDS

- Treatment Plant Operator – Under 5 MGD
- Treatment Plant Operator – Over 5 MGD
- Collections System Operator – Over 5 MGD
- Collections System Operator – Under 5 MGD
- Supervisor – Under 5 MGD
- Supervisor – Over 5 MGD
- Pretreatment Specialist
- Maintenance Specialist
- Laboratory Technician
- Young Professional
- IT Specialist

Forms available online at [www.weau.org](http://www.weau.org) or from the WEAU Awards Committee. For more information, Tiffini Adams at 801-647-5719 or by email at [awardsweau@gmail.com](mailto:awardsweau@gmail.com).

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# WHAT DOES AI KNOW?

(ABOUT WASTEWATER OPERATORS)

Introduction and prompts by Ben Skousen, and responses by ChatGPT

Hello again, *Digested News* readers. Welcome to the second article in our series about artificial intelligence (AI), written mostly by AI. If you recall, this series uses a conversational AI called ChatGPT, to learn more about the expanding field of AI. Let me remind you that ChatGPT works on a prompt/response basis. Basically, the user (me) provides a prompt, and the AI (ChatGPT) responds in a natural way using information found on the internet. Because ChatGPT uses the internet, I will ask for references that you can use to verify the information in its response. As always, I'll make a wastewater-related prompt or two to highlight how ChatGPT works using something we all know and love. Let's begin!

**PROMPT (Ben):** List examples of AI and what they do?

**RESPONSE (ChatGPT):** Artificial Intelligence (AI) is a broad field that encompasses various subfields and approaches, each with its own focus and applications. Here are some of the different kinds of AI and what they do:

**1. Narrow or Weak AI:** This type of AI is designed and trained for a specific task. It can excel at that task but lacks general cognitive abilities. Examples include virtual personal assistants (like Siri or Alexa), chatbots, and recommendation systems (like those used by Netflix or Amazon).

**2. General or Strong AI:** This is the concept of AI that possesses human-like cognitive abilities and can understand, learn, and apply knowledge across a wide range of tasks, similar to how a human can. Strong AI remains largely theoretical and has not been achieved yet.

**3. Machine Learning (ML):** This is a subset of AI that involves training algorithms to learn patterns from data and make predictions or decisions based on that learning. Types of machine learning include:

- **Supervised Learning:** Algorithms are trained on labeled data, making predictions or classifications based on past examples.
- **Unsupervised Learning:** Algorithms learn patterns from unlabeled data to discover hidden structures or relationships.
- **Reinforcement Learning:** Algorithms learn to make decisions by interacting with an environment and receiving feedback in the form of rewards or penalties.

**4. Deep Learning:** A subfield of machine learning, deep learning involves neural networks with many layers (deep neural networks). Deep learning has been successful in tasks such as image and speech recognition, natural language processing, and game playing.

**5. Natural Language Processing (NLP):** NLP focuses on enabling computers to understand, interpret, and generate human language. It's used in applications like language translation, sentiment analysis, and chatbots.

**6. Computer Vision:** This field involves giving machines the ability to interpret and understand visual information from the world. Applications include image and video analysis, facial recognition, and object detection.

**7. Robotics:** AI in robotics involves creating intelligent machines that can perform tasks autonomously or semi-autonomously. This includes industrial robots, drones, and even advanced humanoid robots.

**8. Expert Systems:** These are AI systems designed to mimic the decision-making abilities of a human expert in a specific domain. They use a knowledge base and inference engine to solve complex problems.

**9. Evolutionary Computation:** This involves using techniques inspired by the process of natural selection to evolve solutions to complex problems. Genetic algorithms and genetic programming are examples of this approach.

**10. Cognitive Computing:** This field aims to create AI systems that can simulate human thought processes, such as reasoning, learning, problem-solving, and decision-making.

- 11. Autonomous Vehicles:** AI is a key component in self-driving cars, enabling them to perceive their environment, make decisions, and navigate safely.
- 12. AI in Healthcare:** AI is used for tasks like medical image analysis, drug discovery, personalized treatment recommendations, and patient monitoring.
- 13. AI in Finance:** AI is applied to algorithmic trading, fraud detection, credit scoring, risk assessment, and portfolio management.
- 14. AI in Gaming:** AI is used to create intelligent opponents, simulate realistic behaviors, and generate dynamic game content.
- 15. AI Ethics and Bias Mitigation:** As AI becomes more pervasive, addressing ethical concerns and biases in AI systems is a critical area of research and application.

These are just some examples of the different kinds of AI and their applications. The field of AI is evolving rapidly, and new approaches and applications continue to emerge.

**PROMPT (Ben):** Remind me, what type of AI are you?

**RESPONSE (ChatGPT):** I am a type of AI known as a "language model." Specifically, I am based on the GPT-3.5 architecture, developed by OpenAI.

I specialize in understanding and generating human-like text based on the input I receive. My primary function is to assist with a wide range of natural language processing tasks, including answering questions, providing explanations, offering creative writing assistance, language translation, and more. However, it's important to note that I am a form of narrow or weak AI, meaning that I excel at language-related tasks but lack general cognitive abilities or consciousness.

**PROMPT (Ben):** Why don't we change subjects: What do wastewater operators do? Please include references.

**RESPONSE (ChatGPT):** Wastewater operators, also known as wastewater treatment plant operators or water resource recovery operators, are responsible for the operation and maintenance of wastewater treatment facilities. These professionals play a crucial role in ensuring that wastewater is properly treated before it is released back into the environment. Their work helps protect public health, the environment, and water resources.

The duties of wastewater operators can vary depending on the size and complexity of the treatment facility, but generally, their responsibilities include:

- 1. Monitoring and Control:** Operators regularly monitor the operation of equipment, systems, and processes within the wastewater treatment plant. They use various instruments and technology to track factors such as water flow, chemical dosages, and treatment efficiency.
- 2. Process Optimization:** Operators adjust treatment processes and equipment settings to optimize treatment efficiency and ensure compliance with regulatory standards. This might involve altering chemical dosages, changing flow rates, or adjusting other parameters.
- 3. Maintenance:** Wastewater operators perform routine maintenance tasks on equipment and machinery to keep them running smoothly. This can include tasks like cleaning, lubricating, and performing minor repairs.
- 4. Troubleshooting:** When issues or malfunctions occur, operators are responsible for identifying the problem, diagnosing its cause, and taking appropriate actions to resolve it. This may involve collaborating with maintenance staff or engineers.
- 5. Data Recording and Reporting:** Operators maintain accurate records of plant operations, process parameters, and maintenance activities. They also prepare reports and documentation required by regulatory agencies to demonstrate compliance with environmental standards.
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protect themselves, their colleagues, and the environment. They must also ensure that the wastewater treatment plant operates in accordance with local, state, and federal regulations governing wastewater discharge and environmental protection.

7. **Training and Supervision:** In larger facilities, experienced operators might train and supervise junior operators or staff members. This helps maintain a knowledgeable and skilled workforce.
8. **Continuous Learning:** The field of wastewater treatment is always evolving with new technologies and regulations. Operators often engage in ongoing training to stay updated on best practices, safety measures, and industry developments.

**References:**

- “Wastewater Treatment Plant Operators” by US Bureau of Labor Statistics ([www.bls.gov/ooh/production/water-and-wastewater-treatment-plant-and-system-operators.htm](http://www.bls.gov/ooh/production/water-and-wastewater-treatment-plant-and-system-operators.htm))
- “Wastewater Operator Certification” by the Association of Boards of Certification ([www.abccert.org/wastewater-operator-certification](http://www.abccert.org/wastewater-operator-certification))
- “Introduction to Wastewater Treatment Operations” by the Water Environment Federation ([www.wef.org/resources/standards-and-publications/training-and-education/training-overview/wef-training/introduction-to-wastewater-treatment-operations](http://www.wef.org/resources/standards-and-publications/training-and-education/training-overview/wef-training/introduction-to-wastewater-treatment-operations))

“• Basic Operation of Wastewater Treatment Plants” by California State University, Sacramento ([www.oup.csus.edu/courses/wwwt/10.htm](http://www.oup.csus.edu/courses/wwwt/10.htm))

Please note that the provided references are for general information and may not be the most up-to-date sources. Always refer to local regulations and trusted industry sources for the most accurate and current information.

**PROMPT (Ben):** How does someone become a wastewater operator? Please include your references.

**RESPONSE (ChatGPT):** To become a wastewater operator, individuals typically follow a structured path that involves education, training, experience, and certification. The specific steps can vary based on your location and the requirements of the wastewater treatment industry in your region. Here is a general overview of the process:

1. **Educational Background:**
  - **High School Diploma or Equivalent:** Most wastewater treatment facilities require a high school diploma or its equivalent as a minimum educational requirement.
2. **Higher Education (Optional but Recommended):**
  - **Associate’s or Bachelor’s Degree:** While not always mandatory, having a degree in a relevant field like environmental science, chemistry, biology, engineering, or a related

discipline can enhance your qualifications and career prospects.

**3. Training and Experience:**

- **On-the-Job Training:** Many entry-level wastewater operator positions provide on-the-job training. New operators work under the guidance of experienced professionals to learn the intricacies of wastewater treatment processes, equipment, and safety procedures.
- **Internships and Apprenticeships:** Some individuals gain experience through internships or apprenticeships, where they can receive hands-on training in a real-world setting.

**4. Certification:**

- **Wastewater Operator Certification:** Obtaining certification is a key requirement for most wastewater operator positions. Certification demonstrates your knowledge and competency in operating wastewater treatment systems. Certification levels (such as Grade I, II, III, IV) typically correspond to the complexity of the treatment facility.
- **Certification Organizations:** Different regions have their own certification programs and organizations that administer exams. For example, in the US, the Association of Boards of Certification (ABC) and state-level



agencies offer wastewater operator certification programs.

#### 5. Exams and Continuing Education:

- **Certification Exams:**

To become certified, you'll need to pass a series of written exams that assess your understanding of wastewater treatment processes, regulations, and best practices.

- **Continuing Education:** Many certification programs require operators to complete ongoing training and education to maintain their certification. This ensures that operators stay up to date with evolving technologies and regulations.

#### 6. Career Advancement:

- **Experience and Additional Certifications:** As you gain experience and advance in your career, you may choose to pursue higher levels of certification, which can qualify you for more complex and well-paying positions.
- **Supervisory Roles:** With experience and additional training, you might be eligible for supervisory or management roles within wastewater treatment facilities.

#### 7. Soft Skills and Attributes:

- **Attention to Detail:** Monitoring and maintaining wastewater treatment processes require careful attention to detail.
- **Problem-Solving Skills:** Wastewater operators often need

to troubleshoot equipment malfunctions and process issues.

- **Safety Awareness:** Safety protocols are crucial in wastewater treatment due to the presence of chemicals and potentially hazardous equipment.
- **Communication Skills:** Operators must communicate effectively with colleagues, supervisors, and regulatory agencies.

For detailed and specific information on becoming a wastewater operator in your region, I recommend contacting local water and wastewater treatment authorities, certification organizations, and educational institutions. They can provide the most accurate and up-to-date information based on your location.

#### References:

- "Wastewater Treatment Plant Operators" by US Bureau of Labor Statistics ([www.bls.gov/ooh/production/water-and-wastewater-treatment-plant-and-system-operators.htm](http://www.bls.gov/ooh/production/water-and-wastewater-treatment-plant-and-system-operators.htm))
- "Wastewater Operator Certification" by the Association of Boards of Certification ([www.abccert.org/wastewater-operator-certification](http://www.abccert.org/wastewater-operator-certification))
- "Introduction to Wastewater Treatment Operations" by the Water Environment Federation ([www.wef.org/resources/standards-and-publications/training-and-education/training-overview/](http://www.wef.org/resources/standards-and-publications/training-and-education/training-overview/))

*wef-training/introduction-to-wastewater-treatment-operations)*

- Information from various state and regional wastewater treatment agencies (specific references may vary based on your location).

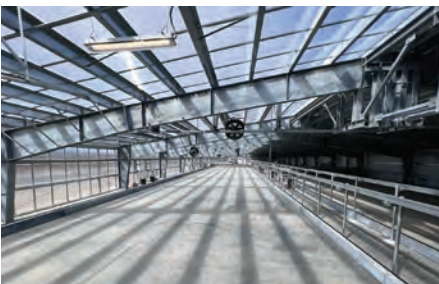
**PROMPT (Ben):** What would we do without wastewater operators?

**RESPONSE (ChatGPT):** Without wastewater operators, society would face significant challenges related to public health, environmental protection, and the sustainability of water resources. Wastewater operators play a crucial role in maintaining the proper treatment and disposal of wastewater from various sources, ensuring that it is safe to be released back into the environment. Here are some of the potential consequences of not having wastewater operators:

1. **Public Health Risks:** Untreated or improperly treated wastewater contains contaminants, pathogens, and pollutants that can pose serious risks to human health. If wastewater were not properly treated, it could contaminate drinking water sources, leading to outbreaks of waterborne diseases and illnesses.
2. **Environmental Pollution:** Untreated wastewater can contain a variety of pollutants, including chemicals, heavy metals, nutrients, and pathogens. If released directly into rivers, lakes, or oceans, this could lead to widespread water pollution, negatively impacting aquatic ecosystems and biodiversity.



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**3. Contaminated Drinking Water:**

Wastewater treatment facilities are responsible for ensuring that treated water meets regulatory standards for safe disposal. Without proper treatment, pollutants could seep into groundwater or surface water sources, compromising the safety of drinking water supplies.

**4. Damage to Ecosystems:** Wastewater discharges that are not properly treated can harm aquatic life, disrupt ecosystems, and lead to oxygen depletion in water bodies. These impacts can affect not only aquatic species but also the entire food chain and natural habitats.

**5. Regulatory Violations:** Wastewater treatment is subject to strict environmental regulations and standards. Without wastewater operators, facilities would fail to meet these requirements, leading to legal violations and potential fines.

**6. Aesthetic and Recreational**

**Impacts:** Polluted water bodies can negatively affect recreational activities such as swimming, boating, and fishing. Foul odors and unsightly water conditions can deter people from enjoying natural water resources.

**7. Economic Consequences:** Water-related industries such as tourism, fisheries, and agriculture could suffer from water pollution. Cleanup efforts and health-related costs resulting from pollution-related illnesses could strain local economies.

**8. Infrastructure Degradation:** Wastewater treatment facilities require regular maintenance and operation to ensure the longevity of equipment and infrastructure. Without skilled operators, facilities could experience breakdowns and deterioration, leading to costly repairs and replacements.

**9. Compliance and Accountability:**

Wastewater operators are responsible for ensuring that treatment processes meet regulatory standards and environmental guidelines. Their absence could lead to non-compliance with environmental laws and lack of accountability.

In summary, wastewater operators are essential for maintaining the health of communities, safeguarding water resources, protecting the environment, and upholding regulatory standards. Their expertise and dedication are critical in preventing a wide range of negative impacts on human health and ecosystems.

Thanks again for reading, and a big thanks to all the wastewater operators out there for all that they do. Hopefully you are learning a little more about AI and what it can do. In future articles, we'll dive deeper into AI and find out what it knows about WEAU, the Great Salt Lake, PFAS, and other topics related to wastewater. [DM](#)



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We all strive to find the talent needed to fulfill requirements, but even when we do most organizations do not know what steps need to be done or what processes need to be followed. But most importantly, organizations typically do not have the tools to assess, monitor, and respond to actions.

For those in the water industry, there is an underlying responsibility we have not just to the organization but also to the public at large. We must keep our infrastructure safe and secure. Threat actors who can pierce security barriers can provide damage beyond the borders of the organization which can have far reaching effects. We need to be resilient in our efforts and vigilant in our monitoring.

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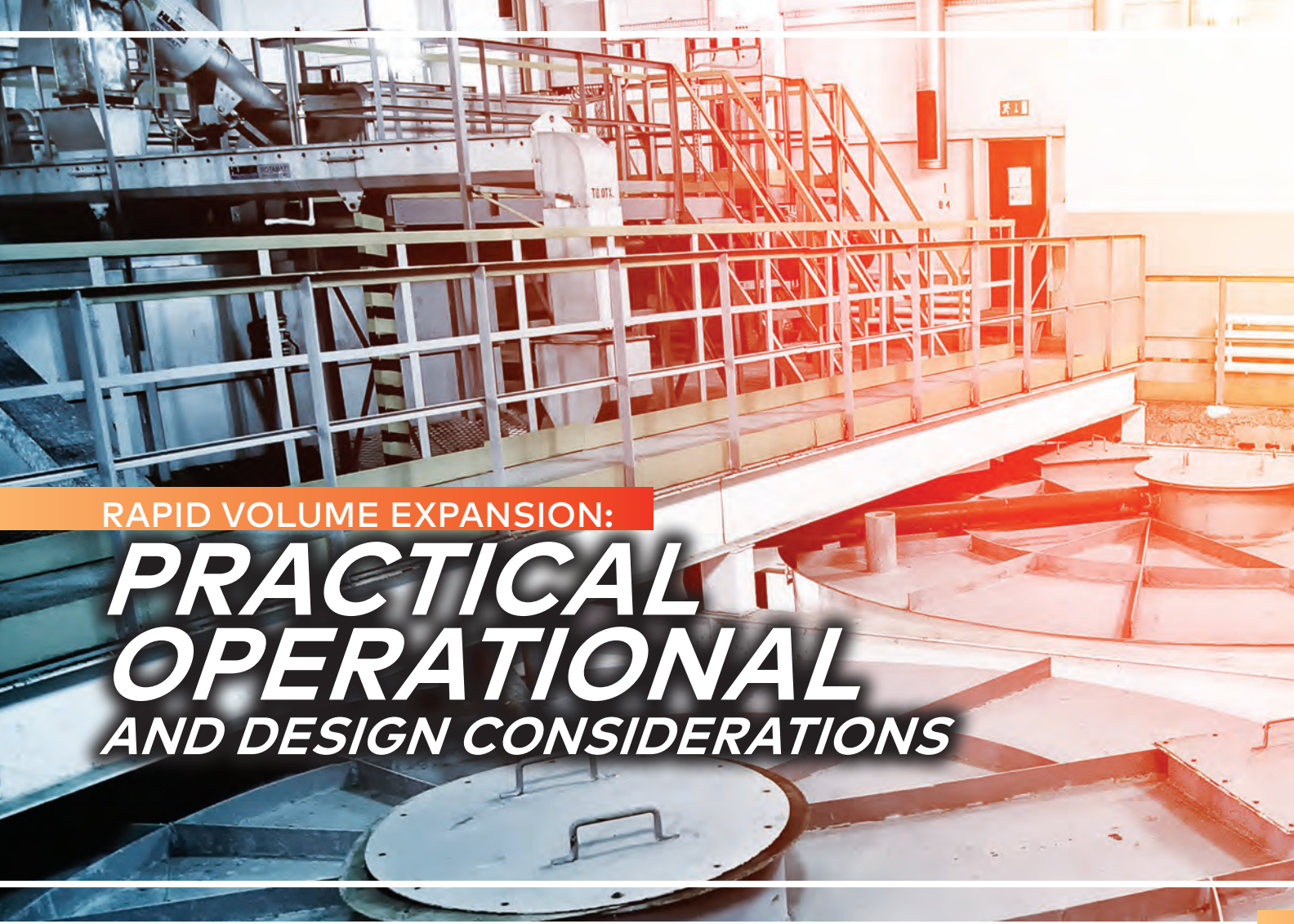
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RAPID VOLUME EXPANSION:

# PRACTICAL OPERATIONAL AND DESIGN CONSIDERATIONS

BY SEAN O'CONNELL AND TOM CHAPMAN, BROWN AND CALDWELL

For decades, wastewater treatment plant operators have been plagued with anaerobic digester foaming, commonly considered to be the caused by excessive loading, filament-laden WAS, unstable startup conditions, etc. In recent years, the industry has identified a special case of serious digester “foaming.” Detailed investigations have revealed that under some situations, the foaming is actually caused by rapid expansion of the digester contents. Analysis of several severe foaming events has led both authors and researchers to hypothesize that foaming as previously understood may not be the cause of such events, but rather a phenomenon that can be generally termed as “rapid volume expansion.”

Foaming within an anaerobic digester can present significant problems for a utility, including: off-site odors, foam/sludge spillage from overflows, loss of digester cover buoyancy on floating cover digesters, fouling of gas lines, and over pressurization of the digester through clogged pressure relief valves (PRVs) and/or emergency overflow piping (see Figure 1). Rapid volume expansion events have different



Figure 1: Digester Contents Compromising Roof Structure Integrity

characteristics than typical digester foaming, and rapid volume expansion can present a significant risk to digester tank itself as well as pose hazards to operator safety. It is important to understand the common

causes of the rapid volume expansion phenomenon in order to mitigate risks. Many utilities may have experienced one of these rapid volume expansion foaming events without realizing that it may have been caused by known factors.

The following attempts to explain the phenomenon, its common causes, its impacting factors, and offer some practical, operational, and engineering considerations.

## Rapid Volume Expansion: What Is It and What Causes It?

The cause of rapid expansion events is thought to be related to a change in gas holdup, the volume of biogas retained in the digester liquid. The volume of gas retained can be influenced by a number of factors including content fluid properties, digester tank configuration, and certain common operational causes. Figure 2 illustrates two conditions, the “NO GAS” showing proper gas removal and mixing, such that minimal gas is retained in the



# THE CAUSE OF RAPID EXPANSION EVENTS IS THOUGHT TO BE RELATED TO A CHANGE IN GAS HOLDUP, THE VOLUME OF BIOGAS RETAINED IN THE DIGESTER LIQUID.

bulk fluid, and “WITH GAS” showing where gas holdup can dramatically alter the apparent volume of the same contents.

### Digester Content Fluid Properties That Can Negatively Impact Gas Holdup

- **Content viscosity:** Higher viscosity slows bubble rise, resulting in more gas holdup.
- **Surface tension:** Surfactants can alter the rate at which the bubbles can transfer through the bulk fluid.
- **Pressure:** In deeper tanks, lower parts maintain a higher pressure. Higher pressures generate smaller gas bubbles which have slower rise, resulting in more gas holdup in the fluid. Egg-shape or “silo” type digesters (see Figure 3) that are tall and relatively slender are more prone to these conditions.
- **Solids particles:** Grit and other solids particles in digester content can potentially impact bubble size.

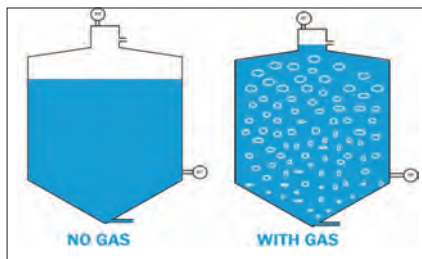


Figure 2: Digester Contents with and without Gas Holdup

### Operational Causes That Can Negatively Impact Gas Holdup

- **Changes in digester feed rates and/or schedules.** Having long interval periods between digester feed events can lead to rapid gas production once raw sludge is introduced to the digester. Continuous feed is preferred to batch feeding.
- **Addition of scum and/or co-digestion substrates.** Adding these substrates can result in dramatic increases in gas production rates.



Figure 3: Modified “Silo” Type Digesters Mimic Egg-Shape Tanks

- **Changes in digester mixing intensity and/or mixing stoppage.** By turning mixing off for periods, then back on, rapid volume expansion events are sure to happen, as seen in power outages. Intermittent mixing is a candidate for operations staff to save on energy costs but could have serious consequences.
- **Sudden gas pressure drops.** Pressure drops can result in gas release from solution, increasing gas holdup.



### Case Study

This six-hour planned power outage was used to observe and measure a rapid volume expansion event. The experiment was executed in modified "Silo" type digesters (59-ft dia., 65-ft deep). A sludge holding tank was connected to receive overflows from the digester. During the six-hour outage, researchers observed digester gas holdup, and quantified the resulting rapid volume expansion as follows:

- Starting density of digester contents fluid reflected good mixing and generation/release. The digester contents fluid specific gravity was 0.92, nearly the bulk density of water.
- Following the six-hour period without mixing or feeding, the end density of the digester contents was much lower, with a bulk fluid specific gravity of 0.77.

Although it may be counterintuitive, during a full power outage without any digester feeding, the gas production went down. However, while the contents were sitting, the active digestion process was still producing gas. The conditions without mixing, combined with sludge viscosity and digester depth caused gas holdup in the fluid.

These conditions resulted in:

- Digester tank liquid rising from 51-foot deep to 61-foot deep.
- 140,000 gallons (11% of digester volume) of digester contents displaced to sludge holding tank.
- An equivalent liquid transfer rate of 400 to 500 gallons per minute of flow observed in overflow to the storage tank.

### Considerations to Mitigate Rapid Volume Expansion

Operational processes and procedures as well as certain engineering design features should be considered to minimize problems that might present themselves with digester operations.

#### Engineering/Design Considerations

- **Reliable tank surface level measurement.** This critical factor includes selection of proper sensor type, placement, and calibration over the range of possible surface fluctuations and specific gravities.
- **Conservatively sized overflow provisions.** Consider weighted manway relief to allow reliefs of content so that tank covers don't get

structurally damaged. Route overflow contents to an appropriate location or containment area.

- **Manage rates of change in mixing intensity.** Slower changes are better.
- **Backup power.** Consider backup power for certain digester component sub-systems such as digester feed, mixing, withdrawal (if pumped), and related instrumentation.

#### Operational Considerations


- **Established procedures.** Digester startup and maintenance Standard Operating Procedures (SOP) should have written procedures addressing activities to be considered and avoided, and emergency operating procedures outlined in response to a rapid rise event.
- **Feed digesters as continuously as possible.** Batch feeding can cause gas holdup.
- **Introduce changes slowly.** If changes to mixing are made, make sure they are done slowly, avoiding extended periods where mixing is completely off.

#### About the Authors

**Sean O'Connell** is Brown and Caldwell's Rockies Area Wastewater Practice Leader. Sean has led the design of seven anaerobic digester projects in the Rocky Mountain and Desert Southwest regions in the last 30 years as well as other digester and biosolids handling projects in other parts of the country.

**Tom Chapman** is digestion subject matter expert in Brown and Caldwell's biosolids group with specialty in the design and operations of anaerobic digestion processes. Tom researched anaerobic digester performance at the University of Washington, and he has two decades of anaerobic digester design experience. Tom has been investigating digester volume expansion since 2011.

#### For More Information

If you have any questions about this topic or would like to talk to Brown and Caldwell's digester and solids process experts, please contact **Marianka Sochanska** in Brown and Caldwell's Salt Lake City office. Phone: 801-316-9815 Email: [msochanska@brwnclad.com](mailto:msochanska@brwnclad.com). 



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The responsibilities of Scott's new position involve a prominent role in directing the activities of sales in the western US. This includes planned growth with current key accounts and developing new sales opportunities within wastewater and industrial marketplaces including power generation and chemical processing. The Regional Manager position is linked to goals beyond sales to include customer satisfaction technical service and overall engagement with agents, representatives, customers, and applicators.

"Scott brings to Sauereisen extensive knowledge of the wastewater industry, application procedures and equipment knowledge. In his short time with us, he has already made great introductions to our customers, distributors and to engineering firms," said Pete J. Jansen, Sauereisen Sales Director.

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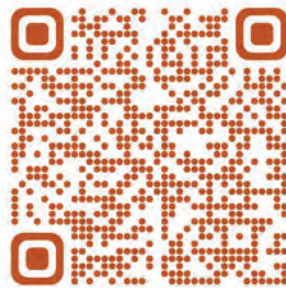


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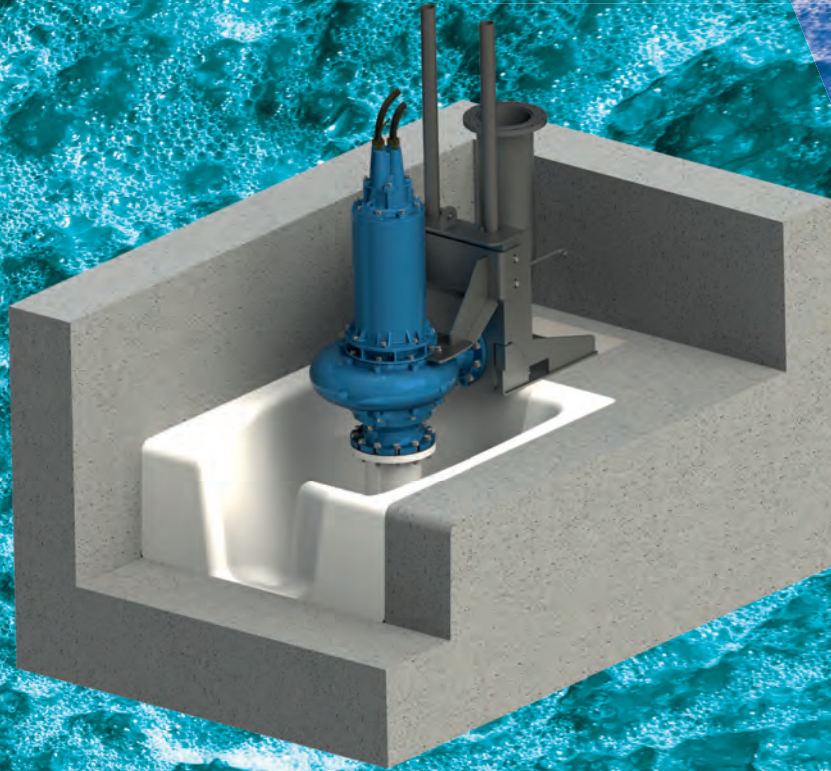


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**CONCERN** for the  
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As we continue to deliver valuable information through the pages of this magazine, in a printed format that is appealing, reader-friendly and not lost in the proliferation of electronic messages that are bombarding our senses, we are also well aware of the need to be respectful of our environment. That is why we are committed to publishing the magazine in the most environmentally-friendly process possible.

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