Aerial view of the city of Ladysmith treatment plant, Ladysmith, Wisconsin

55th Annual W.W.O.A. Conference
October 5-8, 2021
La Crosse Convention Center, La Crosse
Inside This Issue:

- Presidents message / Page 3
- City of Ladysmith / Page 4
- Troubleshooting Corner #1: Recognition / Page 16
- Laboratory Limelight: 21 tips / Page 20
- Troubleshooting Corner #2: Tubifex Worms / Page 26
- The Clarifier needs you / Page 27
- Spring clays sign up form / Page 28
- Scholarships/tuition aid available / Page 29
- List of Advertisers / Page 30

The Clarifier is the publication of the Wisconsin Wastewater Operators’ Association and is intended to inform and educate the membership on issues related to the treatment and control of wastewater. The Clarifier is produced five (5) times each year: February, April, June, September, and December. All members are encouraged to contribute to the mission of the Clarifier.

The Wisconsin Wastewater Operators’ Association is a non-profit organization dedicated to educating, informing, and advancing the wastewater profession. WWOA has approximately 2,000 members divided throughout six regions: Southeast, Southern, Lake Michigan, North Central, Northwest, and West Central.

### 2021 - 2022
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Presidents message: Encourage opportunity

I hope everyone had a happy holiday season and had the opportunity to get out to visit safely. Here in the east central part of the state there is very little snow on the ground so the deer and turkeys haven’t had to visit the crabapple trees in the backyard looking for something to eat. I know it’s still there, but it seems like even the wildlife is staying as close to their own homes as possible.

Many of the WWOA training events are following a similar path. The Midwest Water and Wastewater Operators Expo was not held this year. The Expo committee will meet in a couple of months to begin planning for February 8+9, 2022. Mark your calendars. The Expo is set up to be two one day events rather than a two-day event. This makes it a great opportunity for communities to send more of their operators for a day of learning.

Government Affairs Seminar and Spring Biosolids were also held virtually so that the training and credits are available while staying close to home.

Jeremy Cramer has been working on the technical program for the 55th Annual Conference to be held October 5-8 in La Crosse. The technical committee met virtually on Feb 24th to select presentations for the conference. Jeremy has provided the committee with titles and brief summaries of the abstracts submitted for review and possible session placement prior to the meeting.

Session grouping and placement involves a lot of discussion. It is often a challenge under the best of circumstances. Jeremy has received an amazing 68 abstracts for consideration, the Technical Program has space for 41 presentations and two Pre-conference workshops. Many thanks to everyone that submitted an abstract, your participation is what makes the Conference the educational opportunity that it is for attendees.

This Presidents message seems to focus on opportunity. Even if things are different than we would like, let’s not miss out on opportunities that present themselves and encourage others to do the same, whether that be at work or in our personal lives. Most of all, during this winter season, take every opportunity to get out and enjoy the resources that we water professionals work so hard to protect.

Take care everyone. Looking forward to seeing you.
Don Lintner

Remaining Clarifier Deadlines

| June issue | May 14 |
| Sept. issue | August 13 |
| Dec. issue | November 12 |
The city of Ladysmith saves 63% of energy costs

The City of Ladysmith owns and operates a 2-cell fine bubble aerated lagoon system with a quiescent zone for settling at the end of pond #2. It has chemical addition for phosphorous removal and pH adjustment (to meet NH3 requirements based on a sliding limit) and UV disinfection.

Effluent discharge is to the Flambeau River north of the treatment plant. This is the second generation of the aerated lagoon system. An aging mechanical plant on the south end of the main part of the City, was replaced by a three cell aerated lagoon system across the river on the south end of the City’s industrial park in 1990. In 2014, an upgrade was done to bring it to its current configuration. The design was by Jerry Doriott from SEH.

Flows from the entire City north of the river are pumped across the river from a Main Lift Station. Flows from the industrial park south of the river and from a septage receiving station are pumped from the Industrial Lift Station into the same force main and out to the plant. Normal influent flow is around 350,000 gpd including hauled waste. Before the upgrade, the only screening was a one-inch bar screen at the Main Lift Station. Composite influent sampling was done at the Main Lift Station along with a weekly grab sample from the Industrial lift station. Part of the upgrade was to combine the influent flow monitoring, sampling and screening at the new head works building.

The upgrade began as an energy study to reduce usage and costs. However, it quickly evolved into a full blown rehab. Replacement of aeration equipment, control panels, UV, and addition of a head works building, including a chemical room, and SCADA monitoring, and sludge removal, were identified. Funding was provided by a Focus on Energy grant and the DNR clean water fund.

Lagoons
It was determined that with the size of the existing lagoons, one lagoon could be removed from operation. As lagoon three was absent of sludge, it was determined to abandon it in place for emergency use after construction. During construction it was used while the other lagoons were taken out of service, one at a time. All aeration and wet piping was continued on page 6
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left in place and clean water remained at the riprap level. When it needs discharging, permission from DNR is required and the clean water is siphoned over the dyke.

**Sludge Removal**

Sludge removal began in summer of 2014. Lagoon two was taken out of service by pumping water to lagoon three and closing all valves. The course bubble diffusers were removed and 3’ of sludge was removed by pumping into trucks and hauling and injecting to local fields. Then water from lagoon one was pumped over and the same procedure was used to clear it of sludge. 2.45 million gallons were removed combined.

**Aeration**

Three of the four old Roots 75 hp blowers were removed with the remaining one to be used for backup. A new Kaeser 60 hp blower was installed along with floating air lines and the new fine bubble diffusers. A baffle was installed to separate the last 1/3 of the second lagoon for a quiescent zone for settling.

A VFD is used to control the speed of the blower as well as valves on the floating air lines to adjust DO. The plant went from running two 75 hp blowers at full speed 24/7 to the Kaeser 60 hp 24/7 with VFD speed control. The Blower and alarms are monitored by the SCADA with remote access from anywhere using any type of device (phone, iPad, and computer).

**UV**

The 30 year old Trojan 2000 64 bulb unit was replaced by a self cleaning Trojan 3000+ 16 bulb unit with remote access and monitoring on SCADA.

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continued from page 6

Electrical
The whole plant was rewired including new lights (inside and out), outlets, and control panels as well as a new standby genset.

Head works
A head works building was constructed using prefab panels. It consists of a screen room, chemical room, water booster room, and control room. The influent from the whole City flows through a Huber screen, past a sampling point, and through a Parshall flume for flow measurement. We no longer have to read flows and sample at two locations. The chemical room is next and contains two 550-gallon tanks. One tank holds sulfuric acid for pH adjustment and the other holds ferric chloride for phosphorus treatment.

We use a peristaltic flow paced pump for each chemical with the ferric having two injection points, one to each lagoon. The pumps are monitored and can be control through SCADA. There is also a shower and eye wash if needed.

continued on page 10
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continued from page 8

In order to provide enough water pressure for the screen and shower, a water booster room was added. It contains two 300 gallon water tanks, a hot water heater, and two pumps to supply the need pressure.

Chemical tanks

The electrical control room is last. The Influent sampler is located here to protect it from corrosion. The sample line runs through a carrier pipe to the influent channel. All the controls for the head work equipment and monitoring are located here.

continued on page 12
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The Ladysmith WWTF upgrade was completed in 2015. By switching to fine bubble the total lagoon volume went from

continued on page 14
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continued from page 12

37.4 million gallons to 19.2 million gallons. The energy cost for the last full year of course bubble was $64,000. The energy cost for the first full year of fine bubble was $24,000. That’s a savings of 63% per year of energy costs.

Matt Boehmer, operator

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Troubleshooting Corner: Recognizing those who “get it done.”

By Ryan Hennessy, Microbiology and Operations Specialist for Midwest Contract Operations
rhennesy@mco-us.com

There are many aspects that need to come together for successful treatment plant operation. The “bugs” often get the bulk of the credit as they are responsible for treating the wastewater however wastewater plants do not run themselves and there is a lot that goes into keeping a plant running well. Behind every successful treatment plant operation there is a team of individuals with various areas of strengths working together towards a common goal.

Strong maintenance skills and mechanical aptitude are a must for any team and the true “engine” of what keeps a treatment plant running. The ability to look at things from a functional standpoint, diagnose problems, and come up with the proper solutions have significant impact on the efficiency in which treatment plants are operated. From a managerial standpoint having the right people in the places in which they can succeed and drawing from their technical strengths to help in decision making is critical for continued success.

Doing a quick google search the following are some of the attributes desired for professionals in the wastewater industry:

- Adaptability.
- Dependability.
- Stress tolerance. (Underrated!)
- Initiative.
- Analytical thinking.
- Social orientation/ understanding how to work and communicate effectively with people of various backgrounds.
- Time management.
- Persistence.
- Innovation.
- Written communication skills/ email etiquette.

continued on page 18
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-- Greg Lemahieu, Plant Operator at Village of Oostburg
continued from page 16

- Being open-minded/continued learning ability.
- Integrity.

In addition the wastewater field is broad and includes the following subject matters:
- Mechanical.
- Math.
- Safety and security.
- Chemistry.
- Physics.
- Microbiology.
- Computers and electronics.
- Clerical/documentation.
- Psychology.

Depending on the resources available in each situation there are opportunities to become specialized in certain areas in some instances while in other instances, particularly at smaller plants, a broader range of skill sets is often needed for success.

Some jobs are more specialized in our field while there are other instances in which the operator may also be the maintenance guy (or gal), operate the drinking water and distribution system, maintain the collection system, locate water, storm, and sanitary lines for construction projects, communicate with the utility commission, submit reports to the DNR and do anything else called for in the line of duty.

With the year 2020 being especially challenging during the pandemic it is a good time for us to all remember that we are essential workers and recognize the value in the services we provide in an ongoing basis.

*Please take this moment to give yourself a pat on the back.*

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Corporate Headquarters
Brookfield, Wisconsin
Laboratory Limelight: 21 lab tips for 2021
By Rick Mealy, RGM Lab Consulting

What better way to usher in 2021 than to offer 21 quality tips regarding lab testing. There's a lot to remember regarding lab testing, and as operator-analysts retire, new analysts are taking over. It never hurts to review factors that can impact your testing. The tips below are provided in no set order of importance.

1. If your BOD sample is supersaturated (sample DO exceeds theoretical saturation point), as typically occurs in the winter, your results will be biased high. The difference between the mg/L of sample DO and the theoretical saturation point when multiplied by a dilution's dilution factor tells you how high the results are biased.

2. If you DO have samples that are super-saturated, warm them to 21-22°C and shake vigorously in a partially filled bottle to strip excess DO. It's actually easier to bring samples down to the saturation point if the sample temperature is a degree or two above 20 C.

3. The best estimate of your effluent BOD is TSS. In most cases, TSS and BOD should be roughly equal.

4. As the COVID-19 pandemic has caused us to be more aware of hand sanitization, many lab folks are also disinfecting their testing areas. While this is a great idea to protect yourself, be aware that alcohols can cause high bias in BOD testing. Similarly, bleach takes out bacteria, which are critical for BOD. Overuse of bleach can result in low bias in BOD, especially if bleach spray/residual comes into contact with samples or sample bottles. Nevertheless, bleach is your best choice to disinfect benches and work surfaces. Avoid using spray bottles. Instead use old dish detergent bottles and flood surfaces with a 1% solution of bleach and let sit for a few minutes. Then rinse the surface with plain water. In most cases, however, plain old soap (non-phosphate) and water are generally adequate to sanitize work surfaces. Be careful out there!

continued on page 21
continued from page 20

5. Don’t be afraid to at least CONSIDER results from a BOD dilution that has under- or over-depleted. While these results cannot be included with the average for reporting on the DMR, they can still provide valuable supporting (or not!) information when you are reporting BOD results from a single dilution. Example: two dilutions (3 mL and 6 mL) have the following:

<table>
<thead>
<tr>
<th>Dilution</th>
<th>IDO</th>
<th>FDO</th>
<th>Estimated BOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 mL</td>
<td>8.6</td>
<td>0.9</td>
<td>385</td>
</tr>
<tr>
<td>3 mL</td>
<td>8.6</td>
<td>3.2</td>
<td>540</td>
</tr>
</tbody>
</table>

This example indicates something is up as there is too much disagreement (33% RPD) between the results from the two dilutions. This suggests either contamination or perhaps the 3 mL dilution had a “chunk” in it.

6. Standard Methods suggests that toxicity should be considered when there is 30% difference (or more) between BOD replicates/dilutions. While conceptually, this is good guidance, be aware that as your results approach the LOD, it no longer applies. If you have 2 dilutions for BOD (2 mg/L and 4 mg/L), the RPD is 66.7%. Toxicity? Nope. You are simply at or very close to the LOD and at these levels, there is little difference between 2 and 4 mg/L. Remember, the BOD test is a bioassay. Don’t get too excited if the difference is this small near the LOD.

7. The concept above applies to all test parameters. For example, say your ammonia result for one day is 0.051 and on the next day the ammonia value is 0.058. Is there cause for concern? Ammonia rising in the system for some reason? Don’t panic! Consider the LOD. If the LOD is 0.048, the first value is just barely detectable, and the second really falls into the same class. Also keep in mind what your daily/weekly/monthly permit limits are. If your daily ammonia limit is 1 mg/L, that’s almost 20 times higher than the 0.058 value. Move along; nothing to see here.

8. Face it: there is simply no acceptable alternative to the annoying BOD test. Many labs are looking into COD or even TOC as “quick and dirty(?)” alternatives. Just keep in mind that each of these tests measures something different. TOC is “total” organic carbon, not just that which is broken down by bugs (using oxygen) in the BOD test. Similarly, COD represents the oxygen used in chemical breakdown of organics. Remember, neither of these tests can assess the bioavailability of waste like the BOD test.
as tools? Sure. If you have a stable influent (no significant and variable industrial contribution), then you can do parallel testing of COD and determine a factor that equates COD to BOD at your facility. Just don’t report those results on the DMR!

9. Standard Methods includes a whole “method” about significant figures, but here’s a really simple way to understand them conceptually. If you report a result of 2.17, it suggests that you believe to some degree that you can “see” the difference between 2.17 and 2.18. Can you? Doubtful! Thus 2.17 should probably be reported as 2.2. But, keep in mind what test you are talking about. With BOD, there is no way you could differentiate between two standards measure 2.2 and 2.3, so you have to back things up further and report 2 mg/L.

10. Winter brings us the threat of artic high-pressure systems, which can significantly elevate the theoretical oxygen saturation point. Be aware, if setting up BOD samples during an “artic high” that blanks may fail due to the pressure drop from set-up to read-back.

11. Winter also brings the possibility to see the phenomenon of “cold weather nitrification” leading to higher than normal BOD values. Don’t jump to requesting a permit change to eBOD! Nitrification doesn’t take place to much extent in the plant during those cold winter months but it can occur easily in that nice toasty BOD incubator during testing.

12. If you need a quick measure of system total phosphorous, you can use a Hach or other ortho-phosphorous test to determine the amount of phosphorous that is readily available. You can establish data compared to total P in your plant to make the result even more accurate. This can allow you to make daily, if necessary, adjustments to chemical feed rates to maintain optimal phosphorus removal.

13. Don’t waste time and energy preparing your own reagents and standards. Cost analyses have proven (and you can do your own) that it’s simply less expensive—and more accurate in the long run—to purchase these solutions from a reliable vendor.

14. If you run Test n’ Tube for total phosphorus, you must neutralize the sample prior to beginning analysis. Keep in mind you DO NOT have to adjust the pH to exactly 7.0.

continued on page 24
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15. When checking the pH of samples for total phosphorus, never use a pH meter, as the probe inner body solution contains phosphorus! Always use narrow range pH paper.

16. Too many plants still run ammonia daily. Stop! You can preserve samples and run them once weekly. Barring some emergency situation (e.g., blending, or plant upset), ammonia values are simply not going to vary greatly. And if they are on the rise, you will see it elsewhere in the system (look at oxygen levels in the aeration basins).

17. Less is more when it comes to bleach and hydrochloric acid (HCl) in the lab. Using any more than a 1% solution for rinsing/cleaning is overkill and can cause other problems. Many labs still use 10% HCl. These labs typically see extensive corrosion in their lab equipment. Plus, analysts are breathing those corrosive fumes. This is just plain dangerous, and could expose the plant to legal liability.

18. During clean-up, do you rinse your phosphorus glassware with tap water? If possible, use distilled or deionized water! Many municipal water systems add phosphates to the water supply for corrosion control, so you could be causing background phosphorus contamination. To save the costs associated with producing or purchasing large volumes of distilled/deionized water, check with the water utility and to test the water to confirm it is free from phosphorus. If your tap water is phosphorus free, go ahead and use it!

19. Remember that if your GGAs are coming out low, it is most likely that you have a weak seed or are simply not adding enough seed material. Increase the seed volume to increase the GGA result. Consider switching to a better seed source such as mixed liquor or primary wastewater.

20. DON’T analyze multiple blanks! Remember that there is no “averaging” of blanks. Any blank analyzed must meet acceptance criteria. Blanks, especially for BOD, are tough enough already. Don’t increase your chances of having a blank fail.

21. Finally, remember that any additional testing you do for permit compliance parameters MUST be reported on the DMR! If you decide to run a particular test more than is required by permit “just for your information”, the results still must be reported and included in averages. ☺
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The Village of Roberts new ABNR resource recovery facility is designed to meet a strict phosphorus discharge limit, reduce chemical and energy use, and generate recurring sale of plant-based biomaterial into diverse markets.
Occasionally we receive calls from wastewater treatment plants about large red worms. These worms can grow up to 1 inch long and are large enough to be seen with the naked eye. Tubiflex worms can be problematic in clogging pumps, filters, and other equipment as they grow as “slimy matts”. There are many species of tubiflex worms however these cannot easily be distinguished by morphological traits. The source of tubiflex worms in wastewater treatment processes are often the result of septic/rotting sludge somewhere within the system.

In our experience settled sludge in post eq basins, “dead spots” of aeration basins, and final clarifiers in which the bottom arm may miss a certain area are all potential areas of formation. Other potential areas for formation are septic areas of fixed film processes. As with anything in wastewater any recommendations and control strategies are always a case by case basis depending on the logistics, severity, impact on operations and other considerations. Ideally eliminating the root cause (septicity) can be implemented. In some instances removal is physical and in other instances light chlorination has proved effective in dealing with these critters. In addition to chlorine there are some commercial products available through several companies.

In nature Tubiflex worms are typically found in the sediments of lakes and rivers. Tubifex worms are hermaphroditic meaning they have male and female reproductive organs however these organs develop at different times so they do not self-fertilize. Tubifled worms produce eggs (called cacoons) in which the offspring emerge from their wriggling movements.

Tubiflex worms are harvested industrially for commercial value in fish hatchery effluents or professional worm farms as food for freshwater and tropical fish although this process is not without its complications (compatibility with certain fish, potential for disease carried to the fish).

In 2009 Tubiflex worms went viral on you tube and can be found by searching “ Carolina poop monster”. Hopefully you never experience these critters but if so the most important thing to remember is that locating the source of septic/rotting sludge is critical to discouraging their growth. Ø

**Troubleshooting Corner No. 2: Tubiflex Worms**

*By Ryan Hennessy, Microbiology and Operations Specialist for Midwest Contract Operations rhennessy@mco-us.com*

In our experience settled sludge in post eq basins, “dead spots” of aeration basins, and final clarifiers in which the bottom arm may miss a certain area are all potential areas of formation. Other potential areas for formation are septic areas of fixed film processes. As with anything in wastewater any recommendations and control strategies are always a case by case basis depending on the logistics, severity, impact on operations and other considerations. Ideally eliminating the root cause (septicity) can be implemented. In some instances removal is physical and in other instances light chlorination has proved effective in dealing with these critters. In addition to chlorine there are some commercial products available through several companies.

In nature Tubiflex worms are typically found in the sediments of lakes and rivers. Tubifex worms are hermaphroditic meaning they have male and female reproductive organs however these organs develop at different times so they do not self-fertilize. Tubifled worms produce eggs (called cacoons) in which the offspring emerge from their wriggling movements.

Tubiflex worms are harvested industrially for commercial value in fish hatchery effluents or professional worm farms as food for freshwater and tropical fish although this process is not without its complications (compatibility with certain fish, potential for disease carried to the fish).

In 2009 Tubiflex worms went viral on you tube and can be found by searching “ Carolina poop monster”. Hopefully you never experience these critters but if so the most important thing to remember is that locating the source of septic/rotting sludge is critical to discouraging their growth. Ø

**Jobs available.....**

WWOA has the following jobs posted:

**Conveyance Engineer**
Veolia, Milwaukee

**WWTP Operator in Training**
NEW Water, Green Bay

If interested go to https://www.wwoa.org/member-tools/employment/ for more information or to see other jobs available.

**Have a job to post?**
Send job information to: customercare@wwoa.org
The Clarifier needs you! Your stories, your solutions!

Do you have something to say?
Have you solved a unique problem at your plant?
Won recognition for a job well done?
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Wish to share your opinion on an issue?

Submitting an article can be as easy as mailing a letter or sending an email.

Perhaps you are not a typist or do not have access to a computer? No problem, just write your thoughts down on a piece of paper and we will do the rest.

Or give me a call and we will figure something out.

Jon Butt, Clarifier Editor
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Jon.butt@symbiontonline.com
Office: 414-291-8840

How about telling us about it in the Clarifier?
The front cover of every issue includes the following statement:

“The Clarifier is the publication of the Wisconsin Wastewater Operator’s Association and is intended to inform and educate the membership on issues related to the treatment and control of wastewater. All members are encouraged to contribute to the mission of the Clarifier.”
Register now for spring clays.
Deadline April 1, 2021

Thurs., April 15, 2021
Wild Wings Sportmans’ Club
N865 Hwy. W Campbellsport

Lunch at Noon, 1PM Shot Gun Start, Cost $55

Includes: 13 station/50 target shoot. Bring your own
shells or purchase at Wild Wings. Cash bar after shoot!

Payment should be received no later than April 1, 2021.
Committee will assign stations but if you must shoot with others please advise.
WALK UPS WELCOME.

Prizes for 1st, 2nd & 3rd individual score.
Special raffle for vendor supplied door prizes.

No refunds after April 1, 2021 unless course is closed by decision of club.
Directions from US 41 in Fond du Lac County: East on Hwy. 28 to County W. North on Hwy. W.

Name: ________________________________________________________________

Address: ________________________________________________________________

City: ________________________________________________________________

State/Zip __________________________________________

Names of shooters: ____________________________________________________

________________________________________

________________________________________

________________________________________

___ #paid X $55 each

Mail registration card and fee to: Tom Kruzick, JMI Pump Systems Inc.
W194 N11695 McCormick Drive, Germantown WI 53022


WWOA scholarships/tuition aid available

A special benefit of membership in the WWOA is eligibility towards receiving financial aid for college expenses.

Three, $1,000 scholarships are awarded each year at the annual conference in fall to financially assist a full-time student currently enrolled in an accredited college or university.

Crane Engineering funds one and WWOA funds the other two $1,000 scholarships each year. Eligible students must be at least a second semester student in a degree program supportive of the wastewater field including civil, environmental, or sanitary engineering or other wastewater related degree programs. Award preference is given to a child(step) or grandchild(step) of a WWOA Member.

North Central Laboratories (NCL) generously offers a $5,000.00 two-year scholarship each year to a student enrolled in a wastewater related field (the student receives $2,500.00 each for their Junior and Senior year for a total award of $5,000.00).

The WWOA scholarship committee reviews the applications and recommends the award recipient to NCL. A big thanks to Mike Raynovic and NCL for their generous support of the WWOA and the wastewater field!

Deadline will be early July, 2021.

All forms and brochures are located on the WWOA website: https://www.wwoa.org/member-tools/scholarship-and-tuition-aid/
List of Advertisers

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Mulcahy Shaw Water-Borger..................................page 6
Cady Aquastore..................................................page 7
B&M Technical Service-ShinMaywa............................page 8
Mekco................................................................page 9
McMahon..............................................................page 10
Energenecs..........................................................page 11
Staab Construction ..............................................page 12
Xylem-Flygt ........................................................page 13
B&M Technical Service ........................................page 14
Dorner ...............................................................page 15
Strand ...............................................................page 16
Adaptor................................................................page 16
Energenecs-Huber................................................page 17
Ruekert Mielke....................................................page 18
Visu-Sewer..........................................................page 18
Applied Technologies..........................................page 19
Badger Labs.......................................................page 20
MSA.....................................................................page 20
Symbiont ..........................................................page 21
Process Equipment Repair Services.......................page 22
Crane Engineering..............................................page 23
Mulcahy Shaw Water-Teledyne ISCO .....................page 24
Clearas.............................................................page 25
Donohue............................................................page 27
JF Ahern...........................................................page 29
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I&W Allen..........................................................page 31
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