You’ve Come A Long Way, Berea!

By Sandra O. Vozar, P.E. Plant Superintendent

Background and History

Berea’s water system has a long history since its inception in the early 1900’s. Most of it has been a struggle to provide reliable, consistent, and aesthetically pleasing water. The treatment plant is located in the heart of the city on a peninsula surrounded by Baldwin Creek, the East Branch of the Rocky River, and the Cleveland Metroparks. The water plant is a symbol of the City’s stubborn independence and desire to control its water rates and services. Berea is the only remaining community in Cuyahoga County which hasn’t regionalized with the City of Cleveland. The water source has always been considered substandard to the nearby abundant and pristine Lake Erie sources. On multiple occasions, the fate of the city owned plant and its continued operation to produce drinking water was a matter of only a few councilperson votes.

The water plant is a symbol of the City’s stubborn independence and desire to control its water rates and services.

The Berea water plant is a 3.6 MGD conventional lime softening plant. Chemicals utilized include ferric sulfate (primary coagulant), potassium permanganate (pre-oxidizer), cationic polymer (coagulant and filter aide), orthophosphate (corrosion control and sequestering agent), carbon dioxide (pH adjustment and stabilization), fluoride, and chlorine gas (disinfection).

With the stringent USEPA Stage 2 Disinfection byproduct regulations looming around the corner, Berea once again faced the challenges of meeting required water quality standards. Berea was barely meeting the Stage 1 regulations for total trihalomethanes. Without a doubt, we knew Berea would not meet the Stage 2 regulations.

In 2005, the services of Stantec Consulting of Michigan (formerly Ayres, Lewis, Norris, and May), the designers of the current 1984 vintage plant, was procured and work began with the City Administration and plant personnel to analyze needs and recommend solutions to ensure that Berea’s plant remains viable.

A general plan was developed addressing short term and long term needs of the treatment plant. The short term needs included sandblasting and painting of the clarifiers, tanks, concrete repairs, and a recarbonation system to replace an expensive and hazardous sulfuric acid feed system for pH adjustment. The long term need was to address the Stage 2 and LT2 regulations.

The TTHM Challenge

Berea’s RAA (running annual average) for total trihalomethanes (TTHM) of current monitoring points was hovering at the 60-70 ug/l range. With additional monitoring points required at the extents of the system, as well as the locational averaging of these points, it was a sure bet that Berea would exceed the maximum contaminant level of 80ug/l. The current treatment process would not be able to combat the TTHMs and total organic carbon removal.

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A Virtual Tour Of One Of Our Plants At
It has been a very cold and busy winter for the Ohio section; however it is now time to spring into action.

On January 7, 2011 the Governing Board passed a balanced budget for the fiscal year 2011. Much time, effort and energy went into the budget process. Many budget line items were unfortunately reduced. The OAWWA like many other organizations are facing budget reductions. I would like to thank Bob Gardner, our Treasurer and the Governing Board for their hard work, dedication and most importantly their patience. The Governing Board and I will continue to explore new creative ways to develop new training events which will help fund our overall mission of education and research.

As we spring ahead there are a number of events coming up on the Ohio section calendar for 2011. The Southern Expo will be held on Tuesday, April 12th, and the Northern Expo will be held on Thursday, April 14th. Please take advantage of the latest products and services that our service providers, manufactures and distributors have to offer.

As we spring into action, the Ohio section will once again be participants in the Washington Fly-In. The Fly-in will take off on April 4- 5th. For the first time in history of the Fly-in, AWWA and OWEA will join forces with other Sections visiting Congressional Representatives from their states raising awareness of our current and upcoming concerns of the water community. As a collaborative effort between AWWA and OWEA our voices will be heard on Capital Hill. Thank you to Dave Weihrauch WUC Chair, Cliff Shrive Public Affairs Chair, and Melinda Raimann Strategic planning Chair and Incoming Director for participating with me on behalf of the Ohio section. Speaking of OWEA, Danny Sullivan SW section delegate has expressed interest in exploring a joint AWWA –OWEA conference. As chair, I will be appointing an Adhoc Committee to research the pros and cons and make recommendations to the Board. The Ohio Section will also participate in the RMSO (Regional Meeting Section Officers) will be held on May 13-14th in Custer, South Dakota. This is a great opportunity for Region III Section officers, Section staff, Section Government Affairs Chairs, Section MAC Chairs, and Membership Chairs to come together and brainstorm to address some of the many challenges we face in the industry, and how the Association can better assist in obtaining our goals and objectives.

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On January 27-29th, 2011, Karen Hawkins, our Vice Chair attended the Membership Matters Summit in Denver Colorado. The Summit’s primary focus is to create a successful membership program for our section, energize our membership committee with new ideas and hands on training, and learn how to attract and retain members and get tips from other AWWA section leaders. The Membership committee, Young Professional committee, and I look forward to utilizing some of the innovative ideas and strategies to grow our membership. Membership does matter! If you have not joined the OAWWA, please join today.

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All districts have Ohio Section history books in their possession to be sold at all of the district events. I can’t think of a better way to get contact hours, network with your peers and learn more about the history of the Ohio Section AWWA. With that said, if you have not had an opportunity to attend ACE, I would encourage everyone to experience the world’s largest water event. ACE will be held on June 12-16th, 2011, in Washington D.C. I’ll see you there. I would like to thank our members and volunteers for being a part of the Ohio Section AWWA, and together we are voice of safe drinking water.
Director’s Report

It has been a pleasure to serve as the Section’s Director and representative on the Association Board these past three years. I’ve met a lot of interesting and dedicated professionals. As I leave the Board in June, I’m pleased to tell you that the Association is in good shape financially and the volunteer leadership and Denver staff are top notch. Thanks for the opportunity to serve as Ohio’s Director. It has been a fun experience.

There are always a lot of routine items to discuss and approve at the Association Winter Board Meeting (the board package was over 300 pages). Here are a few highlights from the meeting in San Antonio, Texas:

- The Board approved a 2011 budget with projected income of $28,776,800, projected expenses of $27,957,800, resulting in a net income of $819,000 and capital expenditures of $783,700
- Elections were held at the winter board meeting. Congratulations to the following:
  - Charlie Anderson from the Texas Section (and a member of my Director’s class of 2011) will be the new President-Elect starting in June, 2011.
  - Also starting in June, 2011, Alissa Lockett from the Texas Section will begin her three year term as Director-at-Large, and Rosemary Smud of the California-Nevada Section will begin her three year term as Service Provider Director-at-Large.
  - The following were elected to serve as Association Vice Presidents: Dan Hood (Indiana Section); Dennis Kelleher (New York Section); Gene Koontz (Pennsylvania Section); and Wayne Stiver (Ontario Water Works Association a Section of AWWA)
- The Board also approved a resolution for AWWA to work with WEF in an effort to develop a cohesive voice for the water community. One immediate outcome of the resolution is that WEF will join AWWA for the Washington DC fly-in in April to visit congressional representatives.

Best of luck to Melinda Raimann as she begins her term as Ohio Director in June. Melinda has worked hard for the Section for many years and will represent it well. If you have any questions about AWWA (even after my term ends in June), feel free to call me at 330.397.0788 or e-mail me at btbisson@aquamerica.com.

Aqua’s Annual Water for People Fishing Fundraiser will be held on May 14 at Evans Lake. Evans Lake, which is about 10 minutes south of Youngstown, has been closed to fishing for the general public for six years, and the fishing is usually great in the spring. What a terrific way to have a great day of fishing and support Water for People! Tickets are $25.

Registration Form is on Page 40.
Governing Board Candidates Sought

Are you looking for a way to expand your volunteer efforts with the Ohio Section? Do you like to take on new challenges? Are you interested in growing your industry network? Do you have new ideas to grow the membership or expand services?

If you answered yes to any of these questions, you might be interested in serving on the Ohio Section Governing Board. The Nomination Committee is seeking qualified candidates for consideration for the 2011-2012 board including: Vice Chair, Northwest District Trustee, Southeast District Trustee, At-Large Trustee, and Secretary. These positions will be elected during the Annual Conference Business Luncheon in Cincinnati, September 22, 2011.

All Governing Board members help to guide our organization by participation in board meetings; acting as liaisons or members of Section committees; and participation in policy, program and budget development and implementation. The successful candidates can expect to undertake interesting projects, develop new skills, and build friendships with water industry professionals from across the state of Ohio and beyond.

With the exception of the Vice Chair, all positions are for a three year term and open to active members of the Ohio Section. Of course, the Northwest and Southeast Trustee positions must be filled by a candidate from the respective district. The Vice Chair position is a one year term with automatic succession to the Chair position. Applicants for Vice Chair must have served at least two years on the Governing Board.

Because the work of the Governing Board does take time, the individual selected by the nomination committee must have full support of his/her employer. In addition to the time requirement, we also ask the employer to be prepared to absorb a significant portion of travel and lodging expenses related to Governing Board business.

For further information, please contact Karen Hawkins, Nomination Committee Chair, at 937-754-3097. Interested parties may submit a letter of consideration to her at: 44 W. Hebble Ave., Fairborn OH 45324 or via e-mail at karen.hawkins@ci.fairborn.oh.us.

Award Nominations Being Solicited

2011 Ohio Section Awards Nomination Forms are posted on our Website www.ohiowater.org. The deadline for submission of nominations is May 1, 2011.

**John J. Sadzewicz Award**

To commemorate John J. Sadzewicz for his outstanding contributions to safe public health practices, encouraging the use of proven new technologies and promoting sound operational approaches in meeting regulatory requirements and ensuring safe, potable drinking water for the citizens of Ohio. Since John’s impact on the drinking water community was mainly as a member of the public regulatory sector, it is intended that consideration be given first to people whose career is in that area.

**Operator Meritorious Service Award (Plant)**

Operator Meritorious Service Award is presented to a member who distinguished himself by regular compliance with public health standards, exemplary plant maintenance, development of new ideas, training, and outstanding achievement above and beyond his normal operating responsibilities.

**Richard F. Melick Award**

The Richard F Melick Award is presented to a member of the Section who has distinguished himself/herself by giving unselfishly to the field of operator training and technical education through the Ohio EPA, Operator Training Committee of Ohio, Inc., and/or the American Water Works Association. Richard F Melick was the 3rd Executive Director For Operator Training Committee of Ohio, Inc.

**Operator Meritorious Service Award (Distribution)**

Water Distribution Operator Meritorious Service award is presented to a member who distinguished himself for continued compliance with all public health standards in the water distribution system, and consistent outstanding contribution to distribution maintenance.
The team of Stantec and City personnel began work on examining the options. A trial chlorine dioxide system was installed. The primary coagulant was changed from aluminum sulfate to ferric sulfate. Enhanced coagulation, enhanced softening, and changes in chemical application points were implemented in plant trials. A General Electric TOC analyzer was purchased so that plant personnel could monitor the effects of treatment changes and their impact upon organic removal. Any benefit realized from these treatment changes were not enough to face the THM challenge and also included its own set of related problems such as chlorite byproduct or elevated sludge generation.

Microflocculation was tested at the bench scale level. Although somewhat effective, the Berea Water plant was landlocked and existing facilities could not be retrofitted.

The most promising of all options was to use carbon for adsorption of the organics. Trials were performed on different types of powdered carbon, various feed points, as well as increasing the contact time by using the primary clarifier as a contact chamber. It was found that to effectively combat the THM formation, a dosage of at least 60 mg/l or higher (30 times the normal dosage) was required to remove enough organics from the water. Plant personnel frowned upon this option as it would be manpower intensive, it would contribute to the sludge handling problem, and the water quality would only be improved enough to meet regulations. Powdered activated carbon dust would also have represented a housekeeping issue.

After exhausting the feasible options, GAC (granular activated carbon) was considered as a potential solution. The first step was to perform a pilot study to demonstrate the effectiveness to the team as well as for the Ohio EPA. A pilot study would be required to collect data from the test column of GAC over a year’s time. Because of the secured funding through the Ohio EPA WSRLF (Water State Revolving Loan Fund), and without tangible pilot study results, it could be possible to be lowered on the project priority list below the fundable level. After more research, it was discovered that a RSSCT (rapid small scale column test) which was being reviewed in Columbus as an approved alternative to the in-plant pilot study was another option that could fast track OEPA approval. Ken Yee, lab manager, contacted various laboratories and learned of the partnership of MASI Labs, Dr. Scott Summers, and the University of Colorado who were prominent in this field of testing. For the RSSCT, two 55 gallon drums of post filtered water was collected by MASI Labs, preserved, and shipped to Dr. Scott Summers at the University of Colorado for the bench test. As per Dr. Summers’ recommendation, both an empty bed contact time of 10 minutes and 20 minutes were evaluated. Based upon raw water quality parameters and some background information on the plant, Calgon Filtrasorb 300 was chosen as the promising carbon for Berea’s raw water type for the bench test. Results were turned around in a few months and plans could move ahead.

### SYSTEM INFO

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\text{EBCT} = \frac{(\text{side height}) \times (\text{dia})}{\text{flowrate}}
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The project entailed 6 stand alone vessels which are model 10S by Calgon Carbon. A new 40’ x 60’ split face block building was erected to house the vessels, pipe gallery, and future UV units. To aid in costs as well as aesthetics of the area, the building was designed so that the vessels could span a basement and first floor and blend in with the historic downtown. A 3.7 million dollar price tag on the project, constructed by Workman Industrial Services, of Kent Ohio also included a 800,000 gallon bolted steel storage tank as well as new transfer pumps with VFD’s, SCADA controls, and site improvements for safety and security.

A major challenge of the construction of the new facilities was the excavation of the foundations and spoils of the original 1900 era water plant. Much more of the old plant had been buried in place than originally thought. Teamwork between the contractor, Engineer, and plant maintenance supervisor Len Bradish, kept the change order costs minimal while still providing a reliable foundation for the new structures.

Startup and Operation

The contractor and plant personnel were ready to plan the startup. The order for carbon was placed and the delivery dates had been set. The system was filled with water, sanitized, pressure checked, and the chlorine application point was moved from downstream of the rapid sand filters to GAC filter effluent. The valve sequencing and automation were being put through operational checks. Then, a problem was discovered by the electrician with three battery back up/electric actuated valves. They were not responding and were critical for the startup. A change in delivery date now would put the startup back at least a couple months, pushing it into possibly 2011. The decision was made to leave the date “as is” and trust that the proper tech support and
troubleshooting would come through. Due to the complexity of diagnosing the problem, it was just two days before the first delivery when the issue was resolved as a wiring diagram error.

On Wednesday October 20th, 2010 Berea received the first 40,000 pound truckload of granular activated carbon for vessels 1 and 4. The carbon arrived to the site dry. Water from the vessel was used to fill the truck of carbon with water to make the slurry. Some water was left in the vessel to help cushion and protect the under drain. Plant air was used at 15psig to pressurize the truck. Then the carbon fill valve on the vessel was opened and the Calgon site technician opened the hopper outlet valves. Due to the restrictions on air and water pressure cited in the O & M manual, it took most of the day to transfer the carbon slurry to two vessels. After sitting for a day to “wet” the carbon, the vessels were backwashed and put into service. Fifty percent of our treated water was now being carbon filtered.

The next morning, an amazing difference was already being realized. Pouring the first glass of water at 8 am, there was absolutely no detectable odor or taste. This was only half the water being treated with the new carbon filtering system. We were relieved that promises to the public of the excellent water quality were now a truth. The plant operators were having trouble keeping pH in check and the free chlorine residual was climbing rapidly even with drastic chlorine dosage cuts. This hadn’t been anticipated so quickly.

That Friday was the third and final delivery of yet another 40,000 pounds of carbon. After unloading this last load of carbon, it was now midday and the next set of vessels were backwashed. This initial backwashing prior to startup removes the carbon fines which otherwise could make the finished water appear grey and the carbon would not be stratified properly causing inefficiency later. Finally, at approximately 2pm on Friday October 22nd, another pair of vessels was put into service and 100 percent of the water was being carbon filtered. Berea residents would now be receiving the water quality they long deserved.

With all the research done, networking with others, and meetings with the manufacturer, suppliers, and engineers, plant personnel were prepared for almost everything (or so thought) for the startup and new GAC filtration process. Upon startup, a few sudden changes in water chemistry occurred and the following observations were noted:

**pH of GAC effluent was dramatically increased**
A typical dosage of 1.5-3.0 ppm of carbon dioxide was used to lower pH from 10.3 (clarifier effluent) to 9.3 (plant tap). After the GAC went online, the CO2 dosage went up to over 11 mg/l to keep the pH at the desired level, an increase of 7 times the typical dosage. Plant personnel were unaware of the effect and immediately contacted the project manager at Calgon to find out an explanation. It was understood that this wasn’t unusual and that there can be a “breaking” in period. This period lasted for approximately 3 days. Fortunately, the CO2 feeder was set up for feeding the increased dosage.

**Chlorine demand dropped rapidly**
On the morning of October 21st, chlorine dosage was 4.2 with a free tap residual of 1.6 mg/l. Just 24 hours later, the chlorine dosage had dropped to 2.1 mg/l with a free residual of 1.6 mg/l.
Chlorite being removed
The Berea WTP was limited to a chlorine dioxide dosage of 1.0 mg/l because there was virtually no chlorite removal in the then current treatment process. Options (ferrous sulfate) were looked at previously to remove chlorite but were untried due to constraints. With the onset of GAC filtration, most of the chlorite was being removed. A typical chlorite level was 0.5 mg/l. At the inception of carbon almost all of the chlorite byproduct was being removed with a level of 0.05mg/l. Currently, over 3 months later, more than half of the chlorite is still being removed. This was an added benefit but there is concern over the chlorite also contributing to carbon exhaustion.

Backwashing indicators
Backwashing was discussed during the design phase between Stantec engineers and city personnel. Plant personnel knew that there would be a need to backwash periodically. A concern during design was backwashing with finished water containing free chlorine which would contribute to carbon exhaustion. Stantec’s design included backwashing with combined filter effluent from the rapid sand filters or with GAC effluent prior to the chlorine application point. Once plant personnel had the carbon filters backwashed and online, the question was “When will we know we need to backwash?” The answer was not straightforward. It obviously would depend on water quality that was being sent to the tank and vessel building.

Tank foundation pour during December 2009 was challenging
Vessels were installed prior to masonry wall construction

Building & tank being erected simultaneously
continued on page 10
GAC contactors and how the contactors were being used (parallel or series) and the volumes through each. Plant personnel expected a backwash every few weeks. It has proved to be every two months. Per Calgon’s project manager, the loss of head through the vessels would change very little, but once the head loss reached 5 psi across the filter, it would start to change rapidly. At about 8 or 10 psi drop, they recommended backwashing.

**GAC exhaustion and change out**
The looming question in the minds of Berea personnel is “When will we know and how fast will we see the GAC exhaust?” This again, can only be answered by seeing how well the GAC performs over the course of time in the treatment plant. Using the RSSCT as a guideline, Berea is expecting the carbon to last 120 days at an EBCT of 10 minutes. At a temperature of 50°F, the GAC could be operated to a TOC effluent concentration of 3.0 mg/l before approaching the 72 ug/l target (includes a 10% safety factor). Currently, the vessels are operating with a minimum EBCT of 20 minutes. Currently, the average EBCT with all six vessels in service at the average flow rate is 28 minutes. Plant personnel had originally desired to leave two vessels offline and reserve them for when the first two vessels reached exhaustion. But another unknown was discovered that the carbon should not sit longer than one to two weeks as per Calgon’s recommendation, otherwise a disinfection procedure with sodium hydroxide and then a neutralization procedure would be required. Plant personnel attempted to leave vessels offline for a week but it triggered a chlorine demand spike when they were put back online. Therefore, all vessels have remained in service and flow rates were varied through the vessels to attempt to stagger the exhaustion rates of each.

Where We are Today

After more than three months in operation, TOC (total organic carbon) levels of the GAC effluent appear to be stabilized at approximately 2.0 mg/l. The GAC life appears to be performing somewhat better than predicted, and may be attributed to bio-treatment which cannot be predicted in the RSSCT. At this level, THMs are expected to be comfortably below the maximum contaminant level. Referring to figure 1, there had been a steeper slope for the breakthrough TOC for the first 30 days. Fortunately, the exhaustion rate has decreased and appears to have leveled out. Plant personnel have not changed flow rates and EBCT through the vessels to achieve this 2.0 mg/l value. This has been presented as an option and may be the operating indicator when the Stage 2 regulations are required to be adhered to in January of 2013.

Also on the horizon, Ultraviolet disinfection is very probable. The new piping system in the GAC building was designed in a manner that would accommodate the addition of a new UV system, if it becomes necessary. Plant personnel are working on optimizing current treatment practices as well as studying new technology to improve water quality further and to meet future regulations. Thanks to improved treatment technologies, skilled operational staff, and source water protection, Berea water has come a long way.
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FitchJA@CDM.com

**MAC Representative**
Ken Rogozinski
Bissnus, Inc.
440-871-8394
krogozinski@bissnusinc.com

**MAC Representative**
Thomas J. Bierley
Siemens Water Technologies
419-427-1067
thomas.bierley@siemens.com

**MAC Representative**
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513-942-2888
tsimmons@mscwaterworks.com
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2011 Ohio Section Annual Conference  
Cincinnati; September 20-23, 2011

Conference Sites
Hilton Netherland Plaza and the  
Duke Energy Convention Center

Preliminary Schedule of Events

**Tuesday**  
Golf Outing (Kenton County GC)  
Early Bird Technical Sessions*  
Cadillac Ranch Social Outing

**Wednesday**  
Kickoff Breakfast  
Exhibits and Educational Tours*  
MAC Lunch  
Competitions – Tapping, Top Ops, Meter Madness,  
Water Taste Test  
MAC Mixer  
Young Professionals, Diversity, and Membership Mixer

**Thursday**  
Concurrent Technical Sessions*  
[am]  
Business Luncheon  
Concurrent Technical Sessions*  
[pm]  
Meet & Greet Reception; Banquet

**Friday**  
Concurrent Technical Sessions*  
[am]  
Tour

**Notes:**  
*contact hour approval pending, Items in italics are tentatively scheduled

---

**You’ll have a GREAT time!!**

**That’s No Bull!!**

Join your AWWA friends Tuesday evening for dinner, cocktails,  
conversation and lively entertainment - Rock-n-Roll style!

At Cincinnati’s:

See conference announcements for details.
Ohio Section Annual Conference
Sponsorship Opportunities
September 20 – 23, 2011
Cincinnati, Ohio

Here is the opportunity to get your product and name out to many, many professionals in the water and wastewater industry.

<table>
<thead>
<tr>
<th>Sponsor Levels</th>
<th>Sponsorship Recognition</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Platinum $1,250</td>
<td>All sponsors will be recognized by:</td>
</tr>
<tr>
<td>□ Gold $1,000</td>
<td>• Signage at each event</td>
</tr>
<tr>
<td>□ Silver $750</td>
<td>• Acknowledgement at Opening Session</td>
</tr>
<tr>
<td>□ Bronze $500</td>
<td>• Listing in Conference Program</td>
</tr>
<tr>
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<td>• Recognition in pre- and post-Conference publications.</td>
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</tbody>
</table>

Firm Name__________________________________________________________

(List Company Name EXACTLY as you wish it to appear in printed material)

Contact Name ______________________________________________________

Address __________________________________________________________

City______________________________________________________________

State_______ Zip Code________________________________________

Phone___________________________ Fax _____________________________

Email ____________________________________________________________

☐ Check is enclosed   Make check payable to: Ohio Section AWWA

Amount: $________________

Credit Card Type: (Circle one) Visa   MC   Discover   American Express

Card Number:_________________________ Exp. Date ______/____

Cardholder’s Signature:_________________________ Billing Zip: __________

Return form with payment to: Ohio Section AWWA – Sponsorship
ATTN: RaShawn Truss
3972 Indiana Avenue
Columbus, Ohio 43214
614.268.3244 FAX

If you have any questions please contact:
RaShawn Truss
(614) 265-3180
oawwa@ohiowater.org
2011 AWWA Ohio Section

Golf Outing and Cookout

Tuesday, September 20, 2011
The Golf Courses at Kenton County
3908 Richardson Road
Independence, Kentucky 41051

Golf Scramble Format: Shotgun start at 11:00 am
Green Fees, Cart, Lunch: $300.00 per team

The attached form must be filled out and returned with remittance before August 12th, 2011 to:

Ohio AWWA Section - Golf Outing
Attn: RaShawn Truss
3972 Indianola Ave.
Columbus, Ohio 4321-3158

Days Schedule
Registration 10:00 am - 10:30 am
Shotgun Start 11:00 am
Cookout (Provided at the turn) 11:00 am - 2:30 pm
Awarding of Golf Prizes 5:00 pm

We have reserved both the Pioneer and Willows courses for the outing. The Pioneer course plays to 6,010 yds. at par 71 with the Willows course playing to 6,734 yds. at par 72. Awards will be presented for the top three teams on each course, along with prizes for the longest drive, closest to the pin, etc. Teams are encouraged to register as early as possible to guarantee the course of their choice.

?? For Golf Outing Questions contact Jason DeLaet ??
Greater Cincinnati Water Works at 513-591-5007
2011 Golf Outing and Cookout
Complete and Return by August 12th 2011 to:

Ohio Section AWWA
Attn: RaShawn Truss
3972 Indianola Ave.
Columbus, Ohio 4321-3158

Questions?
Call Jason DeLaet - Greater Cincinnati Water Works at (513) 591-5007

Course Preference: Pioneer / Willows
(Preference on 1st come basis / Circle One)

Team Captain: ___________________________ Phone: _______________________

Company: ___________________________ Fax: _______________________

Address: _____________________________________________________________

e-mail: ___________________________

Team Members
Name _______________________________ Company __________________________
1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________

MANUFACTURERS AND CONSULTANTS
!!! BE A SPONSOR !!!

Sponsorship Type – Please Check Choice(s)

__ 1-Hole Sponsorship ($150)   __ 2-Hole Sponsorship ($250)
__ Door Prize Sponsorship ($100)   __ Refreshment Sponsorship ($125)

Enclosed is a team registration check for $300.00 (4 x $75) = _________
Enclosed is a check for Sponsorship(s) = _________

Check # _______    Total = _________
Meter Madness Contest

When?

Here is your opportunity to participate in the Meter Madness Contest at the Ohio Section Annual Conference. The Meter Madness Contest will be held on Tuesday, September 20, 2011 in Cincinnati, Ohio from approximately noon to 2:00 pm.

What is Meter Madness?

Meter madness is a fast paced, individual competition in which competitors race against the clock (and each other!) to assemble a 5/8” residential meter contained in a bucket of parts.

Contestants are judged upon their assembly time, accuracy, and sign of meter leakage. Hersey meter will the meter used in this year's competition. You can contact your local Hersey Distributor or Mike Gradoville for a loose assembled meter to practice with.

Penalties are assessed for:

- Leaking Connection, barely oozing water and just discernible to the judges
- Slow, obviously dripping connection
- Squirting, continuously leaking connection
- Safety violation(s)
- Meter not properly put together and a part is too loose or falls off, or
- Meter fails to register flow when tested.

The winner of the Ohio Section Meter Madness contest will be eligible to compete for the National title at the Annual Conference and Exhibit (ACE) in Dallas, Texas, June 2012.

Want to find out more?

Visit http://www.ohiowater.org/oawwa/

Interested in competing? Registration forms are due by August 31, 2011.

Name: ___________________________ Title: ___________________________

Utility: _________________________________

Address: __________________________________________________________

City: ___________________________ State: ___________ Zip: ________________

Phone: ___________________________ Fax: ___________________________

E-mail: __________________________________________________________

Send to: Mike Gradoville, 190 Newport Drive, Youngstown, OH 44512

Any questions? Please call: 513-252-8407, or email: mgradoville@aymcdonald.com
The Ohio Section Tapping Committee would like to invite Ohio Water Utilities to send a tapping team to the Section Tapping Contest. This year’s contest will be held on Tuesday, September 20, 2011 in Cincinnati, Ohio. This contest originated in Ohio and has grown to become a highlight of the National contest each year. The winner of our Section contest will be given the opportunity to represent the Ohio Section at the Annual Conference & Exhibit (ACE) in Dallas, Texas in June of 2012. 
TIME: Between 10:00am and 12:00 pm

**Tapping Contest Entry wForm**

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<tr>
<th>Utility Name</th>
<th>Contact Name</th>
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To register your team for this event, please complete this form (one form per team) and return it by **August 31, 2011** to:

**Mike Gradoville**  
190 Newport Drive  
Youngstown, OH 44512

Any Questions? Please call 513-252-8407 or email mgradoville@aymcdonald.com

---

**2011 Ohio Section Annual Conference**

**Cincinnati; September 20-23, 2011**

**Hilton Cincinnati Netherland Plaza**

35 West Fifth Street  
Cincinnati, Ohio  
USA 45202  
Tel: +1-513-421-9100  
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- **2 Double Beds Deluxe Room**  
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- **1 Queen Bed Superior Room**  
  *rates from $159.00 USD/Night*

Book by August 26th to reserve your room.

Register online by visiting the Ohio Section AWWA website, or contact the hotel directly at 513-421-9100. Group name is **OAWWA 2011 Annual Conference**.
2011 Ohio Section Top Ops Competition

The Top Ops committee will soon begin to prepare for the summer district competitions. We would like to encourage all plant operators to consider taking a shot at Top Ops. You do not necessarily need to have a whole team together. Your District representatives will be glad to hook you up with other interested operators. District winners will go on to compete at the State AWWA conference in September.

Managers are encouraged to allow at least one member of their staff to participate in the Top Ops competition at the District level. A study manual is available for those interested, and five contact hours can be gained by completion of the study guide along with participation in the district competition.

Anyone interested can get more information from their Top Ops District Reps:

Northwest District
Russell Bales
419/221-5170

Northeast District
Tom Loren
216/664-3190

Southwest District
Bill Theall
937/754-3081

Southeast District
Michael Burris
614/888-4953

Top-Op’s Team Entry Form

Due June 30, 2011

To register your team for the summer district contests, please complete this form (one form per team) and return it by June 30, 2011 to: Kevin Gleich, 940 Dublin Rd., Columbus, OH 43215 Any questions? Please call: 614-645-6559, or email: kcgleich@columbus.gov
Best of the Best – Ohio Section Water Taste Test

Date:       Wednesday, September 21, 2011
Time:       Afternoon
Location:   Exhibit Hall, Duke Convention Center

Entry forms must be received by August 31, 2011. Water samples are to be dropped off at the Exhibit Hall between 10:00 - 11:30 AM the day of the Competition. Two samples should be brought, each in a 1-liter container. The suggested container is a glass, Teflon-capped container with no air at the top. Each container must clearly identify the name of the water system.

Official Water System Name

Contact Name

Contact Email

On Site Representative and mobile phone number

Treatment and Source Water

(for informational purposes only – will not be made available to judges)

Signature

By signing, you certify that the water will not been altered, and that the water will be potable for consumption.

** All entries must be a Utility Member of AWWA, with no state or federal drinking water violations (MCL, monitoring, recordkeeping, etc) during the previous calendar year. **

THE WINNING WATER SYSTEM WILL BE ANNOUNCED FOLLOWING THE TASTE TEST.

Please return this entry form to Cliff Shrive at cliff.shrive@stantec.com or faxed to 513.842.8274 by Wednesday, August 31. Phone 513-824-6744   Mobile 513-646-4886
Ohio Section AWWA
Exhibitor Information

| Place:            | Duke Energy Convention Center  
|                  | Telephone: 513 419-7300  
|                  | www.DukeEnergyCenter.com  
| Hours of Operation: | Wednesday, September 21, 2011  
|                  | 10:30 a.m. to 5:00 p.m.  
| Shipping:        | Exhibit shipments will be received by the Duke Energy Convention Center  
|                  | beginning Tuesday, September 20, 2011.  
| Set-up Hours:    | Tuesday, September 20, 2011  
|                  | 4:00 p.m. to 8:00 p.m.  
|                  | Wednesday, September 21, 2011  
|                  | 7:00 a.m. to 9:30 a.m.  
| Exhibit Removal: | All exhibits must be removed Tuesday September 21, 2011 by 10:00 p.m.  
| Booth:           | 10’ wide by 8’ deep booth, carpeted with pipe & drape, skirted table, two chairs,  
|                  | and sign w/Exhibitor name. Aisle clearance will be strictly enforced per fire  
|                  | department requirements.  

Exhibit fee includes booth plus Exhibit day registrations, lunch, Mixer tickets and MAC social activities fee for three (3) Exhibit booth attendees, share of door prizes and $25 donation to Water for People. There is an additional fee of $100.00 for electrical service. Electrical service must be requested prior to September 2, 2011 to receive this price.

Exhibitor Fees:

| $550.00 By July 1, 2011 | $575.00 After July 1, 2011 |

Return your check, payable to Ohio Section AWWA, with a signed contract to:

Ohio Section AWWA Exhibits  
ATTN: RaShawn Truss  
3972 Indianola Avenue  
Columbus, OH 43214-3158  
Phone: 614-265-3180  
Fax: 614-268-3244  
Email: oawwa@ohiowater.org

Deadline to Register: September 1, 2011

For Information on:  
Ted Simmons  
ted.simmons@mscwaterworks.com  
(513) 942-2888  
or  
RaShawn Truss  
oawwa@ohiowater.org  
(614) 265-3180

All Exhibits are in conjunction with the Manufacturers/Associates Council (MAC) of the Ohio Section AWWA.
**Exhibitor Registration**
Ohio Section AWWA 2011 Annual Conference

The undersigned Tabletop Exhibitor (hereinafter referred to as the Exhibitor) hereby agrees to participate Exhibits at the Ohio Section AWWA Conference, Wednesday, September 21, 2011 as described herein and information. The Exhibitor agrees to pay the designated Exhibitor’s registration fee of $550 postmarked by $575 postmarked after July 1, 2011. The Exhibitor also agrees to all terms of the "Liability and Responsibility" part of this contract. In the event that an Exhibitor wishes to cancel the contract and forfeit the exhibit space of the registration fees will be made up to September 2, 2011. No refunds will be made after that date.

**Liability and Responsibility**

By signing this contract, the Exhibitor agrees to assume full liability and responsibility for any and all damages, claims, or expenses (including attorney fees) arising from injury or damage to Exhibitor’s displayed and other property brought upon the Duke Energy Convention Center premises. The Exhibitor shall indemnify the Ohio Section AWWA (OAWWA), the Duke Energy Convention Center, the City of Cincinnati, their agents, servants, members, and employees of any and all injuries, losses, damages, expenses.

The Exhibitor also agrees to hold harmless the OAWWA, the Duke Energy Convention Center and the City any and all injuries, losses, damages, claims, or expenses (including attorney fees) that may occur to the Exhibitor’s employees or property, or to any other person or property by reason of the Exhibitor’s use of facilities prior to, during, or subsequent to the period covered by this contract and agrees to expressly release the Duke Energy Convention Center and the City of Cincinnati from such liability.

The indemnification obligation set forth shall be void as to an indemnitive, including its officers, agents, servants and employees whose negligence or willful misconduct was the sole cause of the incident given rise to damage, or claim. This indemnification shall not be limited in any way by limitation on the amount or by compensation, or benefits payable by or for the Exhibitor under workers compensation acts, disability benefits, employee benefit acts.

The exhibition event is scheduled from 10:30 AM to 5:00 PM on September 21, 2011. It is mutually agreed that the duty and responsibility of each Exhibitor to install their exhibit before the opening of the exhibition event and their exhibit after the exhibition event closes according to the Exhibitor’s Information section contained in the Under no circumstances shall an Exhibitor dismantle their exhibit before the closing of the exhibition event (September 21, 2011) without prior permission of the Conference Exhibition Committee.

**Contract acceptance signature X__________________________________________ Date: / /**

**EXHIBITOR (please print)**

Name:____________________________________________________ Title: ____________________________

Company:____________________________________________________ AWWWA Member No.:______

Address ______________________________________________________________________________________

City ___________________________ State: __________ Zip: __________

Phone: ( ) ________________ FAX: ( ) ________________ Email: ____________________________

Individually to receive Exhibitor Registration [ ] (1)________________________

NOTE: Please designate primary onsite contact with an X

METHOD OF PAYMENT: [ ] Visa [ ] Master Card [ ] AMEX [ ] Discover

Card No. ________________ Expiration Date: __________ / __________

Name on Card: ____________________________________________________________

Authorizing Signature: ____________________________________________________________
Ohio Section AWWA Annual Conference
Educational Exhibit Tours!

Unique Opportunity to Explain Your Product and/or Services and Help Attendees Earn Contact Hours or Continuing Education Credit At Your Booth.

On Wednesday, September 21, 2011 during the Ohio Section AWWA Annual Conference in Cincinnati, Exhibitors will have a unique opportunity to showcase their products or services and help attendees. Ohio EPA certified operators, registered Sanitarians & Professional Engineers earn contact hours (subject to Ohio EPA approval) or continuing education credits. Presenters are sought to cover highlights of products, services, or solutions in a 15 minute, educational format at their booth. Guided groups of attendees will visit booths at scheduled intervals. In order to obtain approval from Ohio EPA, the presentation must be educational in nature. To participate, please complete and submit this form by Friday, August 5, 2011.

PLEASE FILL IN ALL THE INFORMATION BELOW IN ITS ENTIRETY

1st Presenter Name

Title:

2nd Presenter Name

Title:

Company Name

Full Mailing Address

Address

City: State: Zip:

Phone (    ) - Fax: (    ) -

E-mail Address

Please check only one box below to indicate the subject of your presentation:

[ ] Distribution System [ ] Lab [ ] Water Treatment [ ] Chemicals [ ] Safety Equipment

[ ] Tanks [ ] Pipes [ ] Hydrants [ ] Education/Resources [ ] Other ________________

Speaker teaching Credentials:

________________________________________________________________________

________________________________________________________________________

What information will attendees learn from your presentation (two sentences)?

________________________________________________________________________

________________________________________________________________________

Applicable toward (check all that apply): [ ] OPERATORS [ ] SANITARIANS [ ] ENGINEERS

For additional education requirements
please contact:
Erin Moore at erin@ohiowater.org.
(614) 268-6826

Mail, fax, or email form to:
Erin Moore, Office Manager
OTSCO
3972 Indianola Ave.
Columbus, Ohio 43214
614.268.6826 * Fax 614.268.3244 * erin@ohiowater.org

NOTE: YOU MUST BE AN EXHIBITOR TO PARTICIPATE IN THE EDUCATIONAL EXHIBIT TOURS.
APPLY FOR MEMBERSHIP TODAY!

Section 1: Member Information

Name: __________________________
Title: __________________________
Company or Organization: __________________________
Mailing Address: __________________________
City: __________________________ State/Province: __________________________
ZIP/Postal Code: __________________________ Country: __________________________
Work Phone: __________________________ Fax: __________________________
Home Phone: __________________________
E-mail: __________________________

Method of Payment (Please check your payment option below.)

ANNUAL DUES: $________

SECTION ASSESSMENT: $________

MULTI-SECTION OPTION? $________

TOTAL DUE: $________

Make check payable to AWWA (US funds only).

☐ American Express  ☐ Discover  ☐ MasterCard  ☐ VISA

Card No.: __________________________ Exp. Date: __________________________

No section can be taken on this application until payment is received. 
Due amount guaranteed through December 31, 2009.

Complete application and mail to: AWWA Customer Service, 6660 West Quincy Avenue, Denver, CO 80223-3096. Or fax completed application to: 303.347.0864 Online: www.awwa.org.

Phone: 1.800.926.7337 or 303.794.7711

Were you referred by an AWWA member?  ☐ Yes  ☐ No  Referring Member: __________________________ Member #: __________________________

Applicant’s Signature: __________________________ Date: __________________________

Section 2: AWWA Dues and Assessments

ANNUAL DUES: Individual—$165*  Student—$28*
Grade 02  Grade 14
Operations/Administrative—$68
Grade 06
(US, Canada, and Mexico only)

* All members outside of North America (regardless of grade), student members, and members with APO/FPO addresses will receive e-periodicals only. Print periodicals may be purchased for an additional fee.

SECTION ASSESSMENT:

AWWA has 43 local sections. Your section is determined by your address. However, some sections require additional fees to better serve their local members. Section assessments are mandatory for applicants with addresses as shown:

<table>
<thead>
<tr>
<th>YOUR STATE/PROVINCE</th>
<th>SECTION ASSESSMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut, Maine, Minnesota, Missouri</td>
<td>$8.00</td>
</tr>
<tr>
<td>Alberta, Arizona, Illinois, Iowa, Kentucky, Manitoba, New York, N.W. Territories</td>
<td>$17.00</td>
</tr>
<tr>
<td>Colorado, Illinois, Louisiana, Mississippi, New Jersey, Oregon, Oklahoma, Pennsylvania, Texas, Utah, Washington</td>
<td>$25.00</td>
</tr>
<tr>
<td>California, Florida, Georgia, Nevada, South Carolina</td>
<td>$33.00</td>
</tr>
<tr>
<td>Maine, Massachusetts, New Hampshire, Rhode Island, Vermont</td>
<td>$66.00</td>
</tr>
</tbody>
</table>

Section 3: New Member Profile

What one business activity best describes your company? (Please check only one)

☐ A Water Pollution Control Utilities—Municipally Owned
☐ B Public Water Supply Utilities—Water Utility
☐ C Government—State, Local, Federal
☐ D Consulting Firms
☐ E Contractor
☐ F Private Industrial System or Water Wholesaler
☐ G Manufacturer of Equipment & Supplies (including representatives)
☐ H Distributor of Equipment & Supplies (including representatives)
☐ I Educational Institutions (College and students), Libraries, and other related organizations
☐ J Fully Retired
☐ K Research Lab
☐ L Other (please specify) __________________________

What is your job title? (Please check only one)

☐ A Executive (General Manager, Commissioner, Board member, City Manager, Municipal Supt., Mayor President, Vice President, Owner, Partner, Director, etc.)
☐ B Management (Engineering Division Head, Section Head, Manager, Depts, Administrators, etc.)
☐ C Design and Engineering (Design Manager, Engineering Manager, Elec. Engineer, Planning Manager, Field Engineer, System Designers, etc.)
☐ D Scientific/Non-managers (Chemist, Biologist, Biologist, Researcher, Analyst, etc.)
☐ E Purchasing (Purchasing Agent, Procurement Specialist, Buyer, etc.)
☐ F Operations (Manager, Operator, Maintenance, etc.)
☐ G Marketing & Sales (Marketing, Marketing, Marketing Representative, Sales Associate, Sales, etc.)
☐ H Professional (Educator, Teacher, etc.)
☐ I Other (please specify) __________________________

What areas of the water and wastewater industry are of current interest to you? Circle all that apply.

☐ A Asset Management (AM)  ☐ C Operations (OPs)
☐ B Distribution (D)  ☐ D Regulatory/Engineer (RE)
☐ C Construction (C)  ☐ E Water Management (WM)
☐ D Desalination (DS)  ☐ F Water Quality (WQ)

Section 4: Areas of Interest

1. MULTI-SECTION MEMBERSHIP OPTION: In addition to your own section membership, you may also join other AWWA sections(s). This allows you to receive information on events and activities from other local sections. If this is of interest to you, call 1.800.926.7337 for multi-section information and fees.

☐ A Technical Interest Meetings are provided under AWWA’s Privacy Policy and are not shared with outside parties. Does not affect, result in, or constitute a dramatic contribution. May be considered an ordinary and necessary business deduction. Does not affect the federal Income Tax Return for the AWWA-AMWA, Journal AWWA $50, Government $56, Workforce $8.

Page 27
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North Canton, Ohio 44720
starkstate.edu

Stark State College: conveniently online
Ohio EPA approved contact hours online*

Water Treatment Operations One-year Program

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Credits</th>
<th>Approved Contact Hrs</th>
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<tr>
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<td>32</td>
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<tr>
<td>Second Semester</td>
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<tr>
<td>Permits and Administration</td>
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<td>16</td>
</tr>
<tr>
<td>Water Treatment I</td>
<td>4</td>
<td>64</td>
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<tr>
<td>Pumps, Maintenance and Safety</td>
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<td>48</td>
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<tr>
<td>Technical Elective</td>
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<tr>
<td>Third Semester</td>
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<td>Water Treatment II</td>
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<td>Water Analysis</td>
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<td>Water Certification Exam Prep*</td>
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<tr>
<td>Technical Elective</td>
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<td><strong>TOTAL</strong></td>
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* Proctored final examinations may be required at Stark State College or another testing facility

Wastewater Treatment Operations One-year Program

<table>
<thead>
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<td>48</td>
</tr>
<tr>
<td>Wastewater Collection Systems</td>
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<td>64</td>
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<td>2</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>27</strong></td>
<td></td>
</tr>
</tbody>
</table>

* Eight-week traditional in-class courses
Career Opportunities.

Does your organization have a position to fill or are you looking for a position?

Take advantage of the career opportunities on the AWWA and OTCO web pages.

Visit www.ohiowater.org and select Job Postings.

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Controlling Water Loss Begins with an Audit

By Bernie Bouman and Dan Barr, Burgess and Niple, Inc.

We are now faced with the longest and deepest recession since the Great Depression. Municipalities are faced with shrinking revenues and budgets are strained. Plans to increase water rates are being met with resistance. An effective water loss audit can be an effective tool in identifying water losses that may improve revenues and decrease operating costs.

This article will illustrate the best practices to categorize water consumption, justify investments, and reduce water loss. A water loss control program can produce these four benefits:

1. Better water resource management that efficiently uses source water supplies.
2. Improved finances by increasing revenue and controlling costs.
3. Minimized distribution system disruptions and contamination incidents.
4. The ability to meet potential future regulations governing nonrevenue water. (In Ohio, a bill was introduced during the last General Assembly that would require utilities to disclose their unaccounted-for water percentage on their annual Consumer Confidence Report.)

The first step to begin the water audit is to perform a simple, nonrevenue water (or unaccounted-for water) analysis by dividing the total water produced or purchased by the total amount of water billed to customers. Unaccounted-for water is the remaining percentage or 100% minus the percentage of accounted-for water.

\[
1 - \frac{\text{Total Billed Consumption in Gallons}}{\text{Total Water Supplied in Gallons}} = \text{Nonrevenue Water %}
\]

If the nonrevenue water for a system is above 15%, a full water audit should be conducted in accordance with the AWWA’s M36 Water Audits and Loss Control Programs Manual, Third Edition (2009). This process includes all the required steps to complete an audit plus tools to estimate parameters when accurate information is not available. The process is shown in the following graphic:
The audit process starts on the left of this graphic and accounts for all water pumped into a water system either from internal sources or purchased from another supplier. The analysis then proceeds to divide the flows entering the system into various categories.

The **System Input Volume** is the annual volume to the water supply system from any source. The **Authorized Consumption** is the annual volume of metered and/or unmetered water used by registered customers, the water supplier, and other authorized users. The **Water Losses** category represents the difference between the system input volume and the authorized consumption.

**Water Losses** are then divided into two more categories of consumption – apparent and real losses. **Apparent Losses** are unauthorized consumption, customer metering inaccuracies, theft, and systematic data handling errors. **Real Losses** are water losses through all types of leaks, breaks, and overflows up to the point of customer metering.

**Authorized Consumption** is further divided into **Billed Authorized Consumption** and **Unbilled Authorized Consumption**. **Billed Authorized Consumption** is input volume that is billed and generates revenue. **Non-Revenue Water** is better known as unaccounted-for water and is the sum of **Unbilled Authorized Consumption**, **Apparent Losses** and **Real Losses**.

A free Microsoft Excel spreadsheet from AWWA is available to simplify the process of collecting the information needed to create an accurate and complete audit. The spreadsheet is a helpful tool that provides a step-by-step process of conducting an audit and is available at: [http://www.awwa.org/files/science/WaterLoss/WaterAuditTermsOfUse.pdf](http://www.awwa.org/files/science/WaterLoss/WaterAuditTermsOfUse.pdf).

The AWWA Water Audit spreadsheet will help determine the following:

- Water losses in gallons and dollars
- Apparent losses in gallons and dollars
- Non-revenue water in gallons and percent of water supplied
- Performance indicators such as:
  - Unavoidable Annual Real Losses (UARL)
  - Current Annual Real Losses (CARL)
  - Infrastructure Leakage Index (ILI) [CARL/UARL]
- A business case for improvements:
  - Where should we spend capital to best improve our performance?
  - How much should we spend?
  - How much is lost and where?
  - How does a utility company compare to its peers?

The following information is required by the spreadsheet to perform all the calculations:

- **Water volume supplied in gallons**
  - Water imported/exported
  - Water produced
  - Production meter inaccuracy
- **Authorized consumption in gallons**
  - Billed metered/unmetered
  - Unbilled metered/unmetered
- **Estimate of apparent losses in gallons**
  - Unauthorized consumption
  - Customer metering inaccuracies by volume or percentage
  - Systematic data handling errors
- **System data**
  - Length of mains in miles
  - Number of service connections
  - Average length of service lines
  - Average Operating Pressure
- **Cost data**
  - Total annual operating costs
  - Retail cost/1000 gallons
  - Production cost/million gallons

*continued on page 36*
The spreadsheet uses estimating tools to aid with data gathering and a mechanism to rate the accuracy and validity of input data. For example, if a production meter's accuracy is poor, but it is the only tool available for determining plant production, a user can enter and rate the information with a low accuracy and validity rating. If a production meter recently was replaced or is calibrated regularly, that data should be assigned a high rating. The spreadsheet results will then encourage the user to improve the low validity data to improve the accuracy of the audit.

The spreadsheet also provides default estimates for several parameters. Examples include unbilled unmetered authorized consumption and unauthorized consumption. Unbilled unmetered authorized consumption can include firefighting, hydrant flushing or street cleaning. The spreadsheet will assume that the water consumed for these purposes amounts to 1.25% of the system input volume. Unauthorized consumption includes theft. Default setting in the spreadsheet is 0.25% of the system input volume. Both default percentages are based on extensive research from utility companies across North America; however, these parameters can be revised by the user.

The following example illustrates how the process works. A city (for example, XYZ) has the following actual input data for 2008:

- Water Supplied = 2,117,000,000 gallons imported.
- Authorized Consumption
  - Billed Metered = 1,792,000,000 gallons
  - Unbilled Metered = 2,000,000 gallons
  - Unbilled Unmetered = 2,000,000 gallons
- Water Losses
  - Unauthorized Consumption = 5,000,000 gallons
  - Customer Metering Inaccuracies = 91,000,000 gallons
  - Systemic Data Handling Errors = 0 gallons

Once all data is entered into the spreadsheet, it generates the following key results:

- Nonrevenue Water as percent by volume of Water Supplied: 15.4%
- Annual cost of Apparent Losses: $238,080
- Annual cost of Real Losses: $369,000

The spreadsheet produces many parameters that are useful for benchmarking, and different conclusions can be reached from these results. XYZ's water loss is significant and controlling leakage should be a priority. Notice that this result is partially created because XYZ is purchasing all their water. Another city that produces their own water supply might need to focus more on the apparent or metering losses due to the lower cost of obtaining water.

The spreadsheet results also help to justify the expense of a water loss program. For example, a city should not spend $5 million dollars annually on leak detection when their annual cost from leakage is only $369,000. Spending $100,000 annually might be a more effective use of funding to help reduce the leakage losses.

Utilities should complete these audits annually to document water loss reduction efforts, monitor the condition of the system, and highlight trends in the system. The city of Philadelphia, Pennsylvania has been completing water audits over the last ten years. This data is presented in the following graphs.
Helpful information can be gained by reviewing these audits over time. For example, the city of Philadelphia has been keeping their real losses under control. The leakage volumes generally decreased, but the cost of producing the water increased causing real loss costs to slightly increase. The large spikes in apparent loss costs are most likely due to rate increases since the volumes have remained low, yet the City also may want to focus on meter inaccuracies due to the high revenue losses associated with them.

There is value in performing a system audit when beginning a water loss program. It can steer the limited available funds in the most effective direction and help justify those expenses against revenues lost from water loss.

A future article will review the most effective steps in reducing real and apparent water losses after they have been identified as part of a water loss reduction program.

For further information on this topic, please contact the authors, Dan Barr at dan.barr@burgessniple.com or Bernie Bouman at bernie.bouman@burgessniple.com.
24th Annual
Southern Ohio
Utility Expo
Sponsored by the Ohio SW District
American Water Works Association

Tuesday, April 12th
8:00 a.m. – 2:00 p.m.
Roberts Convention Centre
Just off I-71 at Rt. 68
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Admission FREE!
Vendor Booth Tours for OEPA FREE!
Contact Hours begin at 8:30 a.m.

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Cost is $30 per person PRE-REGISTERED
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System Name ____________________________
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Fax #: ____________________________

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Email maureen.richard @
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Register for Lunch Only, $10 per person.
Name ____________________________
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Number of Lunches __________

Please list names of those for whom you are buying lunches. Send names and check/purchase order payable to OAWWA – SW to Maureen Richard at address shown above.

Lunch Menu
Southern Fried Chicken & Beef Au Jus for the entrées, followed with roasted redskin potatoes & California vegetable medley for sides. There will also be a fresh tossed salad and assorted desserts.

Served 11:15 a.m. To 12:30 p.m.
2011 Northern Ohio 28th Annual Expo
by Water, Wastewater Consultants & Suppliers

Where: Wayne County Fairgrounds, Wooster Ohio
When: Thursday, April 14th, 2011
Time: Registration 8:30am / Expo ends at 3:00pm
For info: Todd Fetty, Expo Chair
PO BOX 107
Orrville, OH 44667
330-684-5131
330-684-5134 FAX
tetty@orrutilities.com

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Workshop on Dealing with Cyanobacteria, Algal Toxins and Taste & Odor Compounds
August 8-9, 2011
Stone Laboratory, Gibralter Island, Lake Erie
13 Contact Hours Offered to PWS Operators

This workshop includes lecture, laboratory, and field workshop to learn about cyanobacteria and toxins, and taste and odor compounds they create; collecting and processing methods; addressing algal toxins and taste and odor compounds in source water and water treatment plants; using remote sensing to track HABs; understanding recent initiatives at the state and national level dealing with algal toxins.

For more information including a syllabus and list of instructors, see http://stonelab.osu.edu/courses/noncredit/

---

Algae Identification Workshop
August 1-2 and August 3-4, 2011
Stone Laboratory, Gibralter Island, Lake Erie

This workshop includes hands-on, lecture, laboratory and field workshop to learn collection, identification, preservation, enumeration, and control techniques and basic ecology of algae.

For more information, see http://stonelab.osu.edu/courses/noncredit/

Direct any questions about either workshop to Linda Merchant-Masonbrink at linda.merchant-masonbrink@epa.state.oh.us
Evans Lake
Water for People
Fishing Fundraiser

Sponsored by Aqua Ohio, Inc.

Date & Time: May 14 from 6:00 AM to 6:00 PM
Place: Check in at ¼ mile west of dam
Price: Adults $25 – Children 12 and under $10
Limited number of boats allowed:
>14 feet, 10 HP limit or respect no wake – Launch fee $10
Boats must be quarantined for 48 hrs or disinfected

Limited number of tickets available.!

Forms can be mailed to or picked up at Aqua Ohio, Inc.
Attn: Water for People
6650 South Avenue
Boardman, OH 44512

Evans Lake has been closed to fishing to the general public for six years. Come out for a great day of fishing. Ticket proceeds will support Water for People in its efforts to improve drinking water and sanitation facilities in third world villages.

www.water4people.org

Evans Lake Fundraiser Registration Form
Please make checks payable to OAWWA/Water for People

Name ________________________________________________
Street Address ____________________________________________
City ______________ State ___________ Zip ___________________
Number of adults attending ______ @ $25 = $_________
Number of children attending ______ @ $10 = $_________
Boat Launch $10.00
Total Enclosed $_________
For more than 30 years, the American Water Works Association and its members have celebrated Drinking Water Week – a unique opportunity for both water professionals and the communities they serve to join together to recognize the vital role water plays in our daily lives.

The theme for AWWA's Drinking Water Week celebrations will be “Water. Celebrate the Essential.” Join AWWA and its member utilities and sections by celebrating with a variety of items for download in the 2011 materials tool box. Among the supporting resources are:

- **Press Releases:** AWWA will send out press releases on pressing issues. The press releases will be made available online, and utilities are encouraged to adapt them for local use.

- **Children's Activity Pages:** Branded to the Drinking Water Week campaign, these pages include activities for children K-3 and activities for older children, along with teachers' guides.

- **Drinking Water Week Ads:** AWWA has created special ads for Drinking Water Week, branded with the “Water. Celebrate the Essential” tagline for the 2011 campaign. The ads are available for use, as is, or utilities can add their logos if they prefer. The ads also can be used as posters or for other consumer outreach.

- **2011 Celebration Contest:** AWWA member utilities are eligible to win $1,000 in consumer materials. Film a creative video, highlighting how you celebrated Drinking Water Week, post it to YouTube, and send a copy of the link to dmueller@awwa.org. The deadline to enter is May 30!

- **Social Media:** Create a Facebook page for your organization, and join the AWWA group to help spread the word through the world of social media. AWWA will be happy to post information about local celebration events, and encourage our friends to alert their friends to Drinking Water Week through status updates, event invitations, and discussions that tie in with the daily press release topics.
2011 AWWA Committee Chairs

Awards and Recognition
Steve Heimlich
Avon Lake Utilities
440-933-3229
SHeimlichalmu@gmail.com

By-Laws Review and Update
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TBD

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Information Technology
TBD

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dpetterski@columbus.gov

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lvalentine@neo rr.com

Nominating
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Karen.Hawkins@ci.fairborn.oh.us

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(Rule)
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Verrick@rtecexpress.net

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(Distribution)
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Research
Co-Chair
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Sadzewicz Award
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Section History - Co-chair
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dbrookhart@jiheng.com

Section History - Co-chair
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AWansing@aol.com

Small Systems
TBD

Strategic Plan
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Cleveland Division of Water
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melinda_raimann@clevelandwater.com

Tapping Contest
Mike Gradoville
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513-252-8407
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937-285-6118
gina.hayes@epa.state.oh.us

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Young Professionals
Robin Liss
MWH
614-324-2224
Robin.A.Liss@mwhglobal.com
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Interested in getting involved?

Name

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Title

Employer

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City, State, Zip

Area of Interest

Please send the Willingness to Serve form to:

Keshia Johnson
Cleveland Division of Water
1201 Lakeside Avenue
Cleveland, OH 44114

216-664-2444
216-664-3330 fax
I wish to purchase _____ copies of the book “HISTORY OF OHIO’S WATER SYSTEMS” at the publication price of $45.00 per book plus $7.00 shipping & handling per book.

NOTE: Books will be available for purchase at the conference for $45.00 per book.)

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Email: oawwa@ohiowater.org • (614) 265-3180 phone • (937) 244-8149 mobile • (614) 268-3244 fax
As a young man, Mr. Wiles enlisted in the Union Army in the fall of 1862 to participate in the Civil War. He was a member of the Tenth New York Cavalry and was named trumpeter for his company. The Tenth New York Cavalry was assigned to the Army of the Potomac and as such Mr. Wiles participated in all of the battles fought by his unit during his three years of service and was said to be present at the surrender of General Lee at Appomattox. Following the War, he returned home where he finished his education at New York Central College.

Mr. Wiles met and married Anna Bates in February, 1869 and to this union a daughter and son were born. (Note: Nellie Wiles was listed as the bookkeeper for the Delaware Water Company in the 1920 Census.) The son went on to become an engineer having graduated from Case School of Applied Science, Cleveland, Ohio in 1905. Mr. Wiles was associated with the Ohio National Guard for many years while working at Delaware Water Co. In 1897, Mr. Wiles was commissioned as Captain and inspector of rifle practice by then Governor Asa Bushnell for the Fourteenth Ohio National Guard regiment. With the outbreak of the Spanish American War, Mr. Wiles attempted to return to active military duty but was not allowed due to the rank he held in the National Guard. Mr. Wiles was active in civic endeavors also having been appointed to the Board of Trustees for the Delaware City Library by then Mayor H. H. Beecher and served as the secretary of the Delaware Commercial Club. Not to neglect his duties with the Water Co., it is said that the number of water customers was doubled during his tenure along with the associated rise in revenues from same. Mr. Wiles was head of the Delaware Water Company from 1892 until his death in 1923, a period of some 31 years.
Ohio Section American Water Works Association

2011 Student Paper Competition
Oral and Poster Presentations

It’s back… This year’s 2011 student paper competition is both for engineering students and those engineers who have graduated within the past year and are now in their first year working in an engineering field. Applicants should indicate the forum in which they prefer to present their papers. The top three oral presentation abstracts and the top poster abstracts will be selected for presentation at the 2011 Ohio Section AWWA Annual Conference. Cash awards of $300, $200, and $100, respectively will be presented to the top three speakers and $100 will be awarded to the best poster. Also the winners will receive an AWWA student membership for one year.

RULES OF COMPETITION

All abstracts that do not comply with format guidelines (i.e. word and figure/table limits) will NOT be considered!

TOPICS: Any paper discussing source water protection, drinking water treatment, analytical methods, water distribution and storage, or other water-related concern is invited

ABSTRACTS: The abstract and competition application (see below) should be submitted to Ohio AWWA by June 24, 2011. Applicants should indicate whether they would like to present their abstract as either a poster or an oral presentation. All students who submit abstracts will receive free registration to the Ohio Section Annual Conference the day of their presentation. The conference will be held September 20-23, 2011 at the Hilton Netherland Plaza, Cincinnati, Ohio. All submitters will be notified by July 15, 2011 about the status of their abstract.

SELECTION CRITERIA: Abstracts will be judged on their relevancy to the drinking water industry and the originality of the ideas, concepts and solutions presented.

ORAL PRESENTATIONS: The authors of the three selected abstracts will give a 25 minute presentation followed by a 5 minute discussion period. Oral presenters will be given a $300, $200, and $100 cash award, a certificate, and a one year AWWA student membership. In addition, the first place winner will be given the opportunity to compete in the Fresh Ideas poster competition at the AWWA Annual Conference and Exposition (ACE), representing the Young Professionals of OAWWA in June 10-14, 2012 in Dallas, Texas. Additional financial assistance for travel expenses, etc. will be provided for this as well.

POSTER PRESENTATIONS: The authors of the abstracts selected for the poster session are invited to prepare a poster about their topic. The posters will be displayed and judged at the conference. A “Best Poster” award of $100 will be given at the end of the poster session.

AUTHORSHIP: Only current or recently graduated (within approximately one calendar year of May 2010) undergraduate and graduate students are eligible for this competition. Faculty advisors cannot be listed as co-authors. However, they may act in an advisory capacity.

In addition, awards for the best papers and poster will be announced in the official publication of the Ohio Section, the Ohio Section Newsletter.

For questions or abstract submissions contact:
Student Paper Competition

Dr. Isabel C. Escobar
Chemical and Environmental Engineering Department
The University of Toledo
Toledo, Ohio 43606-3390

Telephone: 419-530-8267
Fax: 419-530-8086
Email: isabel.escobar@utoledo.edu

Instructions:

1. Abstract should be 500 to 1,000 words in length and double-spaced. Pages must be numbered.
2. Two pages of figures and/or tables can be appended to abstract.
3. Abstracts may be submitted by regular mail or by e-mail. The abstract title page should include the title and whether you prefer an oral or poster presentation. All information that identifies you personally (including your name, address, phone number, e-mail, school name, etc.) should be omitted from the title page of the abstract and sent on a separate page. This assures that an unbiased decision, in regard to the winning abstracts, will be made by the judges who review your abstract.

   Abstracts should be submitted by e-mail, and must be in Microsoft Word or PDF format.
4. Abstracts must be received by June 24, 2011 to be considered.

Application

Name __________________________ Date __________________

Address ___________________________________

Email ___________________________________

Phone ___________________________________

School ___________________________________

Abstract Title ___________________________________

Are you? (check one) ☐ Graduate ☐ Undergraduate

Abstract submitted for (check one): ☐ Oral presentation ☐ Poster presentation

If you are not selected for an oral presentation, would you be willing to present your work in a poster session (check one): ☐ yes ☐ no

Are you an AWWA Member? (check one) ☐ Yes (Member# ____________) ☐ No
2011 DARCE Fund
Diversity Award Reinforcing Continuing Education

Purpose:
To include and promote people of diverse background and professions within the Water Industry. Education in the Water Industry gives opportunity to all who desire to expand their knowledge. By educating our workforce, we take the quality of our service to a new level. The use of this Fund can be used as a catalyst that encourages career growth.

Applicant Eligibility:
Must be currently employed in the Drinking Water Industry. Need not be a member of AWWA to apply. Women and Minorities are encouraged to apply. Previous winners of the DARCE Fund are ineligible.

Awards & Limitation:
A maximum of five vouchers may be awarded annually:
1-$500.00
1-$400.00
1-$300.00
1-$200.00
(All awards are non-transferable. Limited to 1 voucher per person per year)

Training Eligibility:
Vouchers are to be used for registration only for AWWA sponsored training. Examples: Ohio AWWA MEMBERSHIP, Registration for AWWA Customer Service Workshops, Safety Committee Seminars, State or National Conferences, Teleconferences, District Meetings, AWWA Study Review Sessions for Ohio certifications, OTCO Workshops, Seminars, and Courses. All other expenses to be paid for by recipients (travel, meals, etc.). Vouchers can also be used to obtain OEPA Certification in Distribution and Plant Operation.

Requirements:
Must be nominated by an AWWA Ohio Section member. Must complete the 2011 DARCE Fund Application Form. Final applicants must be willing to meet with representatives of the DARCE Fund to discuss personal career objectives.

An education isn’t how much you have committed to memory, or even how much you know. It’s being able to differentiate between what you know and what you don’t.

Application Deadline:
All applications must be postmarked no later than June 17, 2011.

Award Deadline:
Award recipients will be notified no later than September 1, 2011.

Awards will be presented at the AWWA Ohio Section 73rd Annual State Conference in Cincinnati, Ohio. A one day Conference Registration will be provided for acceptance of the award. Please return application to:
Ohio Section, AWWA
Diversity Committee Darce Fund
Attn: Rashawn Truss
3972 Indianola, Avenue
Columbus, Ohio 43214
614-265-3180 Phone
614-268-3244 Fax

“Water means Life for all people”
2011 DARCE Fund Application Form

Please PRINT or TYPE the following information:

Name: ___________________________________________  First  Middle  Last

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Current Employer: ________________________________________________________________

Years in Current Position ____________________  Years in Water Industry __________________

Business Address:  City _______________________  State ________________  Zip Code __________

Daytime Phone: __________________ -  Evening Phone: __________________ -

Name of Immediate Supervisor: ___________________________________________________

Daytime Telephone of Supervisor: __________________ -

AWWA Member Endorsee Signature: ________________________________________________

Endorsee Member # ___________________________  Daytime Phone: __________________ -

In fifty words or less, please complete the following (must be printed or typed):

The DARCE Fund is important to me because:

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No Attachments Please • Application Deadline: June 17, 2011

Signature of Applicant __________________________________  Date ____________________

Please Return Application to:  Ohio Section AWWA
                            Diversity Committee DARCE Fund
                            Attn: Rashawn Truss
                            3972 Indianola Avenue
                            Columbus, Ohio 43214
                            614-265-3180

(Note: Applications must be mailed individually. Facsimiles or emails will not be accepted.)
Scholarship Committee

By: Lorrie Brown

The purpose of the scholarship award is to encourage water industry related education. This scholarship program has been created in an effort to give back to the individuals who support the water industry and the American Water Works Association.

Any Ohio student attending an accredited institution of higher learning during the scholarship year, in a water industry related program (i.e. science, engineering, management, computer information systems, or other water related field) are eligible.

Current Committee members or their immediate family are not eligible to receive a scholarship. State Governing Board members who themselves or immediate family members applied for a scholarship cannot vote for scholarship award winners. No student shall receive more than two scholarships from this program within a ten-year period.

If no students meet the criteria, no awards shall be given during that calendar year. The Scholarship Committee awards the scholarships annually during the fall academic season.

Application submission deadlines are February of each year. Requests for this year’s scholarships were due on February 11. The summer newsletter will contain the names of the 2011 awardees.

Distribution Committee

By: Jennifer Webster

The Distribution Committee continues to be a very active committee at the State level. We have begun planning for our annual Water Distribution Seminar which will be held on July 12th this year in Columbus (see flyer in this newsletter). We have also recently conducted an on-line survey which was answered by utilities across the state about how typical tapping fees are determined and what rates are charged. Results of this survey will be sent to all participants sometime in the first half of this year. During the first meeting of the year, our 2011 committee goals were established which include:

• Organize the annual Water Distribution Seminar
• Provide recommendations for the Distribution Operator Meritorious Award
• Maintain a lending library of books and DVDs related to distribution system operations
• Foster communication between regulators and the regulated distribution community
• Conduct an annual survey about a distribution topic of interest throughout the state

We are always looking for new members to join us. Please consider attending one of our upcoming meetings that are held on the third Wednesday of the month (a mix of conference calls and in-person meetings). We also have a tour scheduled on April 19th of the Clow Water Systems Company manufacturing facility in Coshocton, Ohio. Clow has been manufacturing ductile iron pipe and fittings in the waterworks industry since 1910. For more information about attending our meetings or becoming a member, please contact any of the committee officers noted below.

Committee Website is at: http://www.ohiowater.org/oawwa/oawwa/committees/Distribution/default.htm

Current Committee Officers:
Jennifer Webster, Chair (513) 677-6859 jennifer.webster@arcadis-us.com
Keith Nutter, Vice-Chair (440) 255-3984 x212 kenuitter@aquaamerica.com
Joe Capan, Secretary (330) 872-5656 waterdist@ci.newtonfalls.oh.us
Dan Barr, Past Chair (614) 459-2050 dan.barr@burgessniiple.com
Research Committee

by: Keshia Kinney and Tim Truman, co-chairs

Often in smaller systems operators wear many hats, including customer service. Here are two common complaints and possible solutions.

**Rusty Water**

Reddish or brownish water is caused by iron in the water. This is caused by changes in flow or pressure in the distribution system which can dislodge iron deposits inside water mains. These changes in flow can be caused by water main breaks, increased water flow, fire hydrant use due to testing or fire fighting. Sometimes increased flow through water mains flushes these deposits through your water service line and household plumbing. Older galvanized plumbing pipes inside homes can also cause “rusty” water. “Rusty” water can stain clothing.

Normally, rusty water will clear on its own as the iron deposits settle out.

The discolored water is usually not a health threat, but consumers should avoid using the water until the disturbance is over. Do not use hot water as doing so will draw the rusty water into the hot water tank. Do not use a clothes washer as the rusty water may cause stains.

After the disturbance is over, the cold water taps should be allowed to run until the water clears. If it doesn't clear up after 5 minutes of flushing, wait two hours and try again. Do not flush the hot water lines – this brings rusty water into your hot water tank. “Rusty” debris in hot water tanks can be removed by draining a gallon of water out of the bottom of the tank. This can be done by opening the hot water hose bib (near the bottom of the tank) and draining a gallon of water into a bucket.

**Drinking water often looks cloudy when first taken from a faucet and then it clears up. Why is that?**

The cloudy water could be caused by tiny air bubbles in the water similar to the gas bubbles in beer and carbonated soft drinks. After a while, the bubbles rise to the top and are gone. This type of cloudiness occurs more often in the winter, when the drinking water is cold.

Another cause of cloudiness in cold water comes from calcium. In certain waters, the nontoxic chemical calcium carbonate will precipitate when it is cold. As it is white, this precipitate can cause the water to look cloudy. In this case, however, the particles settle to the bottom (usually in about 30 minutes) in contrast to the air bubbles discussed above that rise to the top of the water fairly quickly. Water with calcium carbonate precipitate in it is perfectly safe to drink or use for cooking, though it may be unappealing to look at.

Orthophosphate is being used by many water utilities as a metal corrosion inhibitor. The substance binds with metal ions, creating a film on the outer pipe scale to prevent corrosion. Occasionally phosphoric acid doses are increased during optimization of corrosion control treatment. This can correlate with customer complaints of white cloudy water. Water quality technicians should collect and test water samples from taps and hydrants in response to these complaints to check for significantly higher levels of phosphate, iron, and aluminum. Filter the samples to determine if the iron and aluminum and phosphate are in particulate form.
Technical Program Committee

by: Gina Hayes, Chair

The Technical Program Committee has formed a new subcommittee to select the recently established “Sixth” Publication/Presentation Award - “Best Presentation at the Annual Conference” award. The Subcommittee will select the best presentation from the previous year’s annual conference to be presented in September at the Ohio AWWA State Conference in Cincinnati. The five existing publication/presentation awards are:

1. Best Paper (Newsletter Article) Award,
2. Best Presentation Award,
3. Best Paper/Presentation Benefitting Small Systems Award,
4. Best Paper/Presentation Delivered by an Operator Award, and
5. Best Presentation at a District Meeting Award.

The Best Presentation and Best Publication Subcommittees will continue to join efforts annually to select the:

• Best Publication/Presentation Benefiting Small Systems Award, and
• Best Publication/Presentation Delivered by an Operator Award.

The Best Presentation Subcommittee will also continue to review the many PowerPoint presentations delivered in Ohio in 2010-2011 to select the “Best Presentation” award; and to select the “Best Presentation Delivered at a District Meeting” award from the nominations sent in by each District.

The Best Publication Subcommittee will continue to review articles from the latest three Ohio Section Newsletters to select the “Best Newsletter Article” award.

For more information regarding these awards, please contact: Gina Hayes, 937.830.7142 Cell, 937.285.6118 Office, 937.285.6750 Fax, gina.hayes@epa.state.oh.us
Announcements

John Kniepper Retired from Avon Lake

John Kniepper retired as Chief Utilities Executive on December 31, 2010, after serving 42 1/2 years for the Avon Lake Municipal Utilities (ALMU). John will be working as a consultant to help develop the operation for the Lorain County Rural Wastewater District.

John attended Ohio University and while working toward a civil engineering degree, his father passed away when he was three years into his studies. John found himself responsible for his mother and grandmother and he desperately needed a job. He started as a laborer for the City of Lorain’s water department in 1960 digging holes, repairing water mains, and performed whatever tasks were needed. After three years, he became a draftsman, designing water lines, putting together bid contracts, and inspecting waterline construction.

In 1968, John applied for a job with Avon Lake Utilities and the rest is history. Avon Lake was only treating water for the city at the time and they relied on revenue from large industrial accounts. The county’s rural water authority was looking for a source of water and had been turned down by Elyria and Lorain. Avon Lake worked out a deal. ALMU sold them the water, and rural water installed and maintained the infrastructure. The plant at the time treated about 4MGD and today treats an average of 23MGD. ALMU has expanded both in reach and physical structures under John’s supervision. AMLU was the first utility in the state to re-rate their filters to allow 6gpm per square foot. Another challenge was dealing with zebra mussels.

John is married to his wife Cheryl and they have three daughters and five granddaughters. John is a member of the Kiwanis Club and has served a lot of pancake breakfasts over his tenure. He served on the Public Library Board of Trustees including that as president when the library was expanded. Currently, he is treasurer for the Peter Miller House Museum. John enjoys fishing, golf, and would like to travel perhaps back to Alaska. Good luck in your retirement John!

Rick Schantz Retired March 1st

Rick Schantz retired as Superintendent for the Village of Archbold on March 1, 2011. Rick retired with 36 years of public service. He started his career as a wastewater and water plant operator with the City of Wauseon. In 1990, he became Superintendent of Water for the Village of Swanton. For the past 12 years, he has served as Superintendent of Water with the Village of Archbold.

Rick has been very active with the Ohio Section AWWA. He served as a Northwest District officer from 1991 to 1995. Rick was an Ohio Section Governing Board member from 2000 to 2006, serving as the Section Chair in 2005. He has also served on several Section committees. In 2006, he received the Operator Meritorious Service Award. Rick is an OTCO Basic Water Correspondence Councilor and he has presented papers at NW District meetings, SDWA Seminars, and the Ohio Section State Conference.

Rick is looking forward to spending more time with his family, golfing, and coaching Special Olympics basketball after he retires.
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The two companies will continue to operate under their existing names, Natgun and DYK, as Divisions of the parent company DN Tanks. Both companies will continue providing quality service to their customers, supporting the design and construction of prestressed concrete tanks.
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Calling All Public Water Systems

Using Ohio EPA's New Automated Messaging System

Ohio EPA will soon begin using a new automated messaging system to contact public water systems during an emergency. Sometimes called a reverse-911 system, we will use the messaging system to communicate information with recorded messages and sending e-mails or text messages. We may also use the messaging system to provide reminders of upcoming or past-due sampling requirements, reporting deadlines, license to operate and certified operator renewals and other deadlines.

Harmful Algal Blooms in Ohio: Progress Report

In the last edition of this newsletter, Ohio EPA introduced you to “Annie, Fannie and Mike” – the nicknames for some of the blue-green algae species (cyanobacteria) that caused concern around Ohio in the summer of 2010. If you recall, these blue-green algae can sometimes overproduce to form harmful algal blooms (HABs), potentially producing toxins that can cause anything from rashes to neurological and liver impairment.

Since then, Ohio has been busy assessing the events of last year and preparing for the 2011 algae growth season. A steering committee, comprised of Ohio EPA, Ohio Department of Natural Resources, Ohio Department of Health and the Ohio Department of Agriculture, has delegated work to three different groups.

- Group 1 is establishing monitoring and outreach protocols.
- Group 2 is establishing standards addressing algal toxins and the appropriate public health response, with respect to both recreational use and drinking water use. These issues are also being reviewed with the Centers for Disease Control, U.S. EPA and other states.
- Group 3 is assessing the causes of harmful algal blooms in water bodies throughout the state, especially in areas where blooms occurred unexpectedly.

The steering committee and agency administrators will review the group recommendations and provide direction on the approach for 2011.

In addition to participating in the steering committee and work groups, Ohio EPA’s Division of Drinking and Ground Waters has been preparing as much as possible for the upcoming algae season, including reviewing the toxin data collected last summer at public water systems. More than 750 toxin analyses were performed on more than 350 raw and finished water samples from public water systems (PWS) in 2010.

Celina, which uses Grand Lake St. Marys as a water source, conducts its own monitoring for microcystin. The city detected microcystin in 98 percent of raw water samples collected near the intake. Eighty percent of the raw water samples exceeded the World Health Organization (WHO) provisional guideline of 1 part per billion (ppb). The maximum near the intake was greater than 250 ppb. Anatoxin-a was also detected in a raw water sample at 2 ppb. While cylindrospermopsin
Ohio EPA

and saxitoxin were found near beaches at Grand Lake St. Marys, they were not detected near the intake. Due to Celina’s advanced treatment, including granular activated carbon (GAC) and ozone, no toxins were detected in the finished water.

Around the rest of the state, microcystin was detected in 38 percent of raw water samples collected from the raw water tap or near the intake from 19 public water systems (excluding Celina). Eleven percent of raw water samples exceeded the WHO guideline of 1 ppb. The maximum was 4 ppb. Cylindrospermopsin and saxitoxin were each detected once, just above the detection limit. With the exception of Celina, anatoxin-a was not detected in any samples from raw water taps or near the PWS intakes.

Microcystin was detected in three finished water samples (1.6 percent). All detections were near the reporting limit and below the WHO guideline of 1 ppb. No other toxins were detected in finished water samples.

Overall, the results of the 2010 monitoring indicate that while some types of algal toxins are relatively common in raw water, high levels occurred only during severe blooms, and treatment processes used by most surface water treatment plants in Ohio appear to be mostly (but not 100 percent) effective. One option may be a risk-based approach to monitoring for toxins based on the severity of the bloom, proximity of the bloom to the intake and the type of treatment in place.

In addition, the AWWA Technology Committee is developing a white paper to help public water system operators evaluate and optimize their treatment processes to deal with algal toxins. The most effective way to limit algal toxin problems is to prevent the blooms from forming. The most effective way to remove algal toxins once blooms have formed is to remove the algal cells while the toxin is still encased within the intact cells. Toxins are much more difficult to remove once released from the cells, so the most efficient and cost-effective method includes optimization of current treatment processes for cell removal.

In the spring, Ohio EPA will provide more information for public water system operators on its website at www.epa.ohio.gov/ddagw, including guidance on assessing a bloom, information about potential screening tools and toxin monitoring, and the treatment white paper discussed above.
Radiological Lab Change

Due to the age of the analytical equipment and the expense involved to replace it, the Ohio Department of Health laboratory is no longer analyzing drinking water radiological samples. In response to this change, Ohio has designated Wisconsin State Lab of Hygiene, Underwriters Laboratories Inc., and Summit Environmental Technologies Inc. as acceptable laboratories for drinking water radiological samples.

Contact Information:

Wisconsin State Laboratory of Hygiene
2601 Agriculture Dr.
Madison, WI 53718
(608) 224-6227

Underwriters Laboratories Inc.
110 South Hill Street
South Bend, IN 46617
(574) 233-4777

Summit Environmental Technologies Inc.
3310 Win Street
Cuyahoga Falls, OH 44223
(330) 253-8211

A complete list of certified drinking water contract laboratories can be found at: www.epa.ohio.gov/ddagw/labs.aspx.

Proposed Rule/Permit Requirement Change

Class V Underground Injection Control Wells

The Division of Drinking and Ground Waters has proposed a change to the underground injection rules (OAC 3745-34-11). The current rule requires a permit to inject any amount of water treatment residuals into the subsurface. The revised rule would allow small discharges of water treatment residuals into the subsurface without a permit. The proposed rule waives this requirement for any discharge of less than 2,500 gallons per month from ion exchange water treatment units, such as water softeners. It would also waive the permit requirement from discharges of backwash water from iron and manganese sand filters. Research has indicated that small discharges of less than 2,500 gallons per month of the high total dissolved solid fluid (up to 30,000 ppm) into an injection well, usually a septic system leach field, will be diluted by the sanitary discharge to an acceptable level. The discharge for the sand filters is mainly suspended solids and so would be filtered from the discharge fluid within the injection well. At a minimum, this rule change will allow about 365 small businesses to avoid the permitting cost.

2011 SWAP Survey Available Online This Spring

In spring 2011, Ohio EPA’s Source Water Assessment and Protection (SWAP) Program will issue a SWAP survey to community public water system operators with moderately to highly susceptible sources of water. Like the baseline survey issued in 2007, this survey will collect information about each system's source water protection activities.

Each year, U.S. EPA requires the state SWAP programs to report the percentage of their community water systems that are substantially implementing source water protection. Ohio’s 2011 report will reflect the results from this survey. This information provides the best available snapshot of the status of source water protection in Ohio, so we are encouraging everyone to respond.

The goal is to make the survey available online, via a secure website. All eligible community system operators will receive a postcard in April-May 2011, with instructions for logging into the online survey. For more information, contact Barb Lubberger at (614) 644-2752 or barb.lubberger@epa.ohio.gov.
Needs Survey Assessment

It’s that time again! You know; the time when all the large drinking water systems (populations greater than 100,000) and a statistical selection of medium-sized systems (populations of 3,300 to 99,999) in the nation are asked to participate in the Drinking Water Infrastructure Needs Survey Assessment (DWINSA). The Safe Drinking Water Act requires that U.S. EPA conduct an assessment of water system capital improvement needs every four years. Ohio EPA administers the Drinking Water State Revolving Fund (DWSRF) on behalf of U.S. EPA. We are also privileged to partner with systems throughout the state to conduct the DWINSA (needs survey).

If you have been selected to participate in the needs survey, you probably have already heard from the DWSRF loan coordinator. The loan coordinators, in conjunction with staff from the Rural Communities Assistance Program (RCAP), are your partners in completing the needs survey. In the past, we have asked individual systems to complete the forms and submit them to us. This year, we decided it may be more helpful to provide more hands-on assistance and work directly with systems. We will identify which projects meet the criteria, compile the required back-up documents and fill out the survey for you. Although you can still complete the forms yourself, having Ohio EPA complete the forms means no memorizing codes and allowable project criteria, fussing with paperwork or filling out the form. In exchange we ask that you, the system, please do the following:

1) Send us a list of your system’s inventory (easy-to-use forms are available):
   a. source, treatment, storage and pumping;
   b. transmission and distribution (including meters, services lines and appurtenances); and
   c. fencing, back-up generators and anything else your system needs to operate properly and safely.

2) Send us your system’s assorted needs-related documents including:
   a. capital improvement plan and/or master plan;
   b. facilities plan and/or preliminary engineering report (dated within the last 10 years);
   c. grant and/or loan application form;
   d. engineer’s estimate and/or bid tabulation; and
   e. monitoring results and/or other documents.

3) Meet or teleconference with your district loan coordinator or your assigned RCAP representative to go over the system inventory and paperwork.

The DWSRF federal capitalization grant allotment to each state is determined by the results of the needs survey. Incomplete surveys will result in a decrease in the Ohio’s DWSRF allotment. Communities that have received a low-interest loan, ARRA funds or principal forgiveness on a loan from the DWSRF program have experienced firsthand the importance of this program. Hundreds of Ohioans are employed as a result of the DWSRF program, including those who are involved in the planning, design and construction of these projects. Systems that have not directly benefited from the program yet, can apply for a loan by sending in a nomination form, previously known as the pre-application, by March 15, 2011. Even healthy systems can benefit by consolidation and regionalization practices with another system, which increases their user base.

By partnering to complete the needs survey information, we hope that together, we can accomplish the process more quickly, while still providing accurate and comprehensive results.

For more information on the needs survey or the SRF program please contact Christine Brock at (614) 644-2752 or by e-mail at christine.brock@epa.ohio.gov. We are here to serve and look forward to working with you in the months to come.
Basic Chemistry For Water Plant Operators

By: Mike Burris, Malcolm Pirnie, Inc.

The purpose of this article is to try to take some of the mystery out of water chemistry. The problem many plant operators and others have with water chemistry is not knowing the equations for specific chemical reactions and not knowing what to do with the reaction equations if and/or when they are found. The following discussion focuses on the chemistry of coagulation, chlorine disinfection, and iron and manganese oxidation. Aside from lime/soda softening, these four processes constitute much of the chemistry encountered at our water treatment facilities.

Equations are presented below to illustrate the chemistry of coagulation, chlorine disinfection, and iron and manganese oxidation. Following this, examples are given to show how the equations can be used to obtain important information for our water treatment plant operations. The atomic weights and molecular weights for the various elements and compounds are used in the examples for this purpose. Remember, the Periodic Table, a listing of all known elements with each element's atomic weight, is your "friend" and can be employed to enable you to use the chemical equations below (and others) to find important and useful information very simply.

First, before we get started, some definitions are in order:

- **Element**: Composed of atoms and may exist naturally as either a gas, liquid or solid;
- **Atom**: Smallest particle into which an element can be divided and still retain the properties of the element;
- **Compound**: The product of the reaction (combining) of two or more elements in specific proportions;
- **Molecule**: Smallest particle into which a compound can be divided and still retain the properties of the compound;
- **Atomic Weight**: The relative weight of an element which defines the proportion (by weight) in which that element will react (combine) to form a compound;
- **Molecular Weight**: The summation of the atomic weights of all the elements present in a compound.

Now, to help understand and use chemical reaction equations, the example below showing the reaction between hydrogen and oxygen to form water is presented to define some of the nomenclature used.
Coagulation Chemistry

Colloidal particles in natural water supplies typically exhibit a net negative charge. The repelling action of these like-charged micron-sized particles maintains the particles in suspension. Coagulation is the process of destabilizing the colloidal particles by reducing the forces tending to keep the particles apart.

The chemicals commonly used for water treatment coagulation applications are as follows:

- Alum; $\text{Al}_2(\text{SO}_4)_3 \cdot 14\text{H}_2\text{O}$
- Ferric Chloride; $\text{FeCl}_3$
- Ferric Sulfate; $\text{Fe}_2(\text{SO}_4)_3$

Even though coagulants are used to remove particles from water, coagulants themselves react with the alkalinity in the water ($\text{Ca(HCO}_3)_2$) to form an insoluble metal hydroxide in the water being treated. It is this metal hydroxide, either aluminum hydroxide ($\text{Al(OH)}_3$) or ferric hydroxide ($\text{Fe(OH)}_3$), which performs the destabilization which results in the agglomeration of the water’s colloidal (turbidity) solids.

The reactions which occur when alum, ferric chloride and ferric sulfate are added to a water supply are as follows:

**Alum**

$$\text{Al}_2(\text{SO}_4)_3 \cdot 14\text{H}_2\text{O} + 3\text{Ca(HCO}_3)_2 \rightarrow 2\text{Al(OH)}_3\downarrow + 3\text{CaSO}_4 + 6\text{CO}_2 + 14\text{H}_2\text{O}$$

**Ferric Chloride**

$$2\text{FeCl}_3 + 3\text{Ca(HCO}_3)_2 \rightarrow 2\text{Fe(OH)}_3\downarrow + 3\text{CaCl}_2 + 6\text{CO}_2$$

**Ferric Sulfate**

$$\text{Fe}_2(\text{SO}_4)_3 + 3\text{Ca(HCO}_3)_2 \rightarrow 2\text{Fe(OH)}_3\downarrow + 3\text{CaSO}_4 + 6\text{CO}_2$$

Similarities among the three coagulation reactions include the following:

- All equations involve the reaction of the coagulant with the alkalinity in the water, i.e., $\text{Ca(HCO}_3)_2$ {calcium bicarbonate};
- All equations show an amount of non-carbonate hardness (calcium sulfate {CaSO}_4) or calcium chloride, {CaCl}_2} formed which is equal to the amount of alkalinity consumed;
- All equations show the production of an insoluble metal hydroxide, i.e., either aluminum hydroxide {Al(OH)}_3 or ferric hydroxide {Fe(OH)}_3.
Chlorine Disinfection Chemistry

Chlorine has long been and will remain the standard for disinfection of our drinking water supplies. Chlorine’s very effective disinfection properties along with its ability to maintain a residual to provide protection within our distribution systems make it unique for drinking water treatment.

Three forms of chlorine are used for drinking water disinfection applications. These are as follows:

- Liquid/Gaseous Chlorine; Cl₂
- Sodium Hypochlorite; NaOCl
- Calcium Hypochlorite (HTH); Ca(OCl)₂

The reactions of these disinfecting chemicals with water are as follows:

**Chlorine**

\[ \text{Cl}_2 + \text{H}_2\text{O} \rightarrow \text{HOCl} + \text{HCl} \]

**Sodium Hypochlorite**

\[ \text{NaOCl} + \text{H}_2\text{O} \rightarrow \text{HOCl} + \text{NaOH} \]

**Calcium Hypochlorite**

\[ \text{Ca(OCl)}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{HOCl} + \text{Ca(OH)}_2 \]

A common product of all reactions is hypochlorous acid (HOCl). *Hypochlorous acid is the disinfecting compound.* In water, hypochlorous acid dissociates as follows:

\[ \text{HOCl} \rightarrow \text{H}^+ + \text{OCl}^- \]

Both the hypochlorous acid (HOCl) and the hypochlorite radical (OCl⁻) possess disinfecting properties, however, the hypochlorous acid molecule is a stronger disinfectant than the hypochlorite radical. At lower water pH values, the hypochlorous molecule is the dominant form, whereas, at increasing pH levels, more of the hypochlorite radical persists. This is reflected in the CT Tables which show that for any given water temperature, the CT values increase as the water's pH increases.

The reactions above also show that a product of the gaseous chlorine reaction is hydrochloric acid (HCl), whereas, products of the sodium hypochlorite and calcium hypochlorite reactions are sodium hydroxide (NaOH) and calcium hydroxide (Ca(OH)₂), respectively. This is why gaseous chlorine treatment applications often experience a slight decrease in pH, whereas, treatment applications with sodium hypochlorite or calcium hypochlorite typically see a slight pH increase.

Iron Oxidation Chemistry

Water, void of dissolved oxygen and in the presence of iron-bearing substances, will dissolve iron. Because of this, most of our groundwater supplies contain varying amounts of soluble iron. The iron present in the water under these conditions exists as ferrous iron (Fe²⁺). For treatment and removal, the soluble ferrous iron must be oxidized to the ferric state, i.e., Fe³⁺. In the ferric state, the iron becomes...
insoluble and precipitates from solution as ferric hydroxide, Fe(OH)$_3$. The oxidants typically used for this process are oxygen (air), chlorine (Cl$_2$) and potassium permanganate (KMnO$_4$), and their reaction equations are presented below:

**Oxygen/Aeration (O$_2$)**

\[4\text{Fe}^{2+} + \text{O}_2 + 10\text{H}_2\text{O} \rightarrow 4\text{Fe(OH)}_3\downarrow + 8\text{H}^+\]

**Chlorine (Cl$_2$)**

\[2\text{Fe}^{2+} + \text{Cl}_2 + 6\text{H}_2\text{O} \rightarrow 2\text{Fe(OH)}_3\downarrow + 2\text{Cl}^- + 6\text{H}^+\]

**Potassium Permanganate (KMnO$_4$)**

\[3\text{Fe}^{2+} + \text{KMnO}_4 + 7\text{H}_2\text{O} \rightarrow 3\text{Fe(OH)}_3\downarrow + \text{MnO}_2\downarrow + 5\text{H}^+ + \text{K}^+\]

The reactions show in each case that the soluble ferrous iron is oxidized to ferric iron and precipitated from solution as ferric hydroxide \(\text{Fe(OH)}_3\). It is interesting to note that for the reaction with potassium permanganate, manganese dioxide \(\text{MnO}_2\) is precipitated along with the ferric hydroxide. This results from the manganese contained in the potassium permanganate compound.

**Manganese Oxidation Chemistry**

Similar to iron, water in the absence of dissolved oxygen and in the presence of manganese-bearing substances will dissolve manganese. Oxidation of the soluble manganese (Mn$^{2+}$) to Mn$^{4+}$ and precipitation and removal as manganese dioxide (MnO$_2$) are common treatment practices for this contaminant. Manganese is more difficult to oxidize than iron, thus aeration is not considered an effective treatment process for manganese removal. The oxidation reactions for manganese with chlorine and potassium permanganate are presented below:

**Chlorine (Cl$_2$)**

\[\text{Mn}^{2+} + \text{Cl}_2 + 2\text{H}_2\text{O} \rightarrow \text{MnO}_2\downarrow + 2\text{Cl}^- + 4\text{H}^+\]

**Potassium Permanganate (KMnO$_4$)**

\[3\text{Mn}^{2+} + 2\text{KMnO}_4 + 2\text{H}_2\text{O} \rightarrow 5\text{MnO}_2\downarrow + 4\text{H}^+ + 2\text{K}^+\]

The reactions show for both the chlorine and the potassium permanganate reactions, the soluble manganese (Mn$^{2+}$) is converted (oxidized) to the insoluble manganese dioxide (MnO$_2$). It is interesting to note that for the chlorine oxidation reaction, 1.58 mg/l of MnO$_2$ are produced for each 1.0 mg/l of Mn$^{2+}$; whereas, 2.64 mg/l of MnO$_2$ are formed per each 1.0 mg/l of Mn$^{2+}$ for the potassium permanganate reaction. This difference is due to the manganese present in the potassium permanganate compound.
Using Chemical Equations to Find What You Need

Chemical equations tell us how elements and compounds react (reactants) and what compounds are formed (products). Through the use of the atomic weights and molecular weights of the reactants and products, along with the chemical equations, quantities of the individual compounds can be determined which can provide important information for your plant operations.

The molecular weight of any compound can be easily determined by merely adding-up the atomic weights of the individual elements which make-up the compound. The atomic weights for all the elements are presented in the Periodic Table.

Example No. 1

Find the amount of manganese dioxide (MnO₂) precipitated from a water supply with a manganese concentration of 1.0 mg/l (Mn²⁺) when treated with potassium permanganate.

1. The potassium permanganate – manganese reaction equation is as follows:

\[
3\text{Mn}^{2+} + 2\text{KMnO}_4 + 2\text{H}_2\text{O} \rightarrow 5\text{MnO}_2 + 4\text{H}^{+} + 2\text{K}^{+}
\]

2. With the concentration of manganese (Mn²⁺) given, the amount of manganese dioxide produced can be found by use of the atomic weight of manganese and molecular weight of manganese dioxide.

Atomic weight of manganese = 55.

Molecular weight of manganese dioxide (MnO₂) = [Atomic Wt. Manganese (Mn)] + [2 x Atomic Weight Oxygen (O)]

and,

M.W. Manganese Dioxide = (55) + (2 x 16) = 87.

The reaction equation shows that the manganese (Mn²⁺) has a coefficient of “3”, and the manganese dioxide has a coefficient of “5”. This means that three atoms of manganese under these reaction conditions produce five molecules of manganese dioxide. Therefore, the atomic weight value to be used for the manganese with this equation is 3 x 55 = 165; and the molecular weight value to be used for the manganese dioxide is 5 x 87 = 435. **This is why knowing the reaction equation is important!**

Now, the quantity of MnO₂ produced can be found by setting-up the atomic weights and the molecular weights of the Mn²⁺ and the MnO₂ along with the known and unknown values as follows:

\[
\begin{array}{ccc}
\text{A.W.} & = & 165 \\
3\text{Mn}^{2+} & + & \text{.........} \\
1.0 \text{ mg/l} & \rightarrow & 5\text{MnO}_2 \\
\end{array}
\]

and, cross-multiplying and solving for “x”,

\[
x = \text{MnO}_2 \text{ produced} = 1.0 \text{ mg/l} \times \frac{435}{165} = 2.64 \text{ mg/l}.
\]
Example No. 2

For coagulation with alum \((\text{Al}_2(\text{SO}_4)_3 \cdot 14\text{H}_2\text{O})\), determine the lbs./day of aluminum hydroxide \((\text{Al(OH)}_3)\) precipitate which are formed at an alum dosage of 45 mg/l and a plant flow rate of 16 mgd.

1. The alum coagulation reaction equation is as follows:

\[
\text{Al}_2(\text{SO}_4)_3 \cdot 14\text{H}_2\text{O} + 3\text{Ca(HCO}_3)\text{2} \rightarrow 2\text{Al(OH)}_3 \downarrow + 3\text{CaSO}_4 + 6\text{CO}_2 + 14\text{H}_2\text{O}
\]

2. With the dosage of the alum known, the amount of aluminum hydroxide produced can be determined by using the molecular weights of the alum and the aluminum hydroxide. The molecular weight of alum \((\text{Al}_2(\text{SO}_4)_3 \cdot 14\text{H}_2\text{O})\) is determined as follows:

\[
M.W. = [2 \times \text{Aluminum (Al) Atomic Wt.}] + [3 \times \text{Sulfur (S) Atomic Wt.}] + [12 \times \text{Oxygen (O) Atomic Wt.}] + [28 \times \text{Hydrogen (H) Atomic Wt.}] + [14 \times \text{Oxygen (O) Atomic Wt.}]
\]

and,

\[
M.W. \text{ Alum} = (2 \times 27) + (3 \times 32) + (12 \times 16) + (28 \times 1) + (14 \times 16) = 594
\]

Similarly, the molecular weight of aluminum hydroxide \((\text{Al(OH)}_3)\) is found as follows:

\[
M.W. = [1 \times \text{Aluminum (Al) Atomic Wt.}] + [3 \times \text{Oxygen (O) Atomic Wt.}] + [3 \times \text{Hydrogen (H) Atomic Wt.}]
\]

and,

\[
M.W. = (1 \times 27) + (3 \times 16) + (3 \times 1) = 78
\]

Now, the alum reaction equation shows that the \(\text{Al(OH)}_3\) produced has a coefficient of “2”. This means that for this reaction two molecules of \(\text{Al(OH)}_3\) are formed for each molecule of alum added to the water. Therefore, the molecular weight value to be used for \(\text{Al(OH)}_3\) with this equation is \(2 \times 78 = 156\). Again, this is why knowing the chemical reaction equation is important.

Then, the quantity of \(\text{Al(OH)}_3\) produced can be calculated by setting-up the molecular weights of the alum and aluminum hydroxide along with the known and unknown values as follows:

\[
\begin{align*}
\text{M.W.} & = 594 \\
\text{Al}_2(\text{SO}_4)_3 \cdot 14\text{H}_2\text{O} + \text{45mg/l} & \rightarrow 2\text{Al(OH)}_3 \downarrow + \text{156} \\
\text{M.W.} & = 156 \\
2\text{Al(OH)}_3 & \downarrow + \text{x}
\end{align*}
\]

and, cross-multiplying and solving for “x”,

\[
x = \text{Al(OH)}_3 \text{ produced} = 45\text{mg/l} \times (156/594) = 11.8 \text{ mg/l}
\]

and,

\[
11.8 \text{ mg/l} \times 16 \text{ mgd} \times 8.34 = 1575 \text{ lbs. Al(OH)}_3 \text{ per day.}
\]

Example No. 3

Determine the chlorine dosage required to oxidize 2.5 mg/l iron (Fe).

1. The iron oxidation reaction equation with chlorine is as follows:

\[
2\text{Fe}^{2+} + \text{Cl}_2 + 6\text{H}_2\text{O} \rightarrow 2\text{Fe(OH)}_3 \downarrow + 2\text{Cl}^- + 6\text{H}^+
\]

2. With the concentration of the iron known, the chlorine dosage can be determined by using the atomic weights and molecular weights of the iron and chlorine, respectively.

\[
\text{continued on page 70}
\]
For the ferrous iron, expressed as the element (Fe\(^{2+}\)), the atomic weight is 56. The equation shows the iron with a coefficient of two, indicating that two atoms of ferrous iron react with one molecule of chlorine. Therefore, the atomic weight value to use for Fe\(^{2+}\) in this equation is 2 x 56, or 112.

For the chlorine (Cl\(_2\)), the molecular weight is found as follows:

\[
\text{M.W. Cl}_2 = 2 \times [\text{Atomic Wt. Chlorine (Cl)}] \\
\text{and,} \\
\text{M.W.} = 2 \times 35.5 = 71
\]

Now, the chlorine demand can be determined by setting-up the atomic weights, the molecular weights and the known and unknown quantities as follows:

\[
\begin{align*}
\text{M.W.} = 112 & \quad \text{M.W.} = 71 \\
2 \text{Fe}^{2+} + & \quad \text{Cl}_2 \\
2.5 \text{mg/l} & \quad x
\end{align*}
\]

and, cross-multiplying and solving for “x”,

\[x = \text{Chlorine Demand} = 2.5 \text{ mg/l} \times \frac{71}{112} = 1.58 \text{ mg/l}\]

**Example No. 4**

Find the dosage of sodium hypochlorite (NaOCl) equivalent to a chlorine (Cl\(_2\)) dosage of 1.0 mg/l.

1. The chlorine and sodium hypochlorite reaction equations with water are as follows:

\[
\begin{align*}
\text{Cl}_2 + \text{H}_2\text{O} \rightarrow & \text{HOCl} + \text{HCl} \\
\text{and,} \\
\text{NaOCl} + \text{H}_2\text{O} \rightarrow & \text{HOCl} + \text{NaOH}
\end{align*}
\]

2. As discussed previously, hypochlorous acid (HOCl) is the disinfecting agent. The chlorine-to-sodium hypochlorite equivalence can be found by first finding how much HOCl is produced by 1.0 mg/l Cl\(_2\), and then finding how much NaOCl is required to produce this quantity of HOCl.

\[
\begin{align*}
\text{M.W. Cl}_2 = 2 \times [\text{Atomic Wt. Chlorine (Cl)}] \\
\text{and,} \\
\text{M.W. Cl}_2 = 2 \times 35.5 = 71 \\
\text{M.W. HOCl} = [\text{Atomic Wt. Hydrogen (H)}] + [\text{Atomic Wt. Oxygen (O)}] + [\text{Atomic Wt. Chlorine (Cl)}] \\
\text{and,} \\
\text{M.W. HOCl} = 1 + 16 + 35.5 = 52.5 \\
\text{M.W. NaOCl} = [\text{Atomic Wt. Sodium (Na)}] + [\text{Atomic Wt. Oxygen (O)}] + [\text{Atomic Wt. Chlorine (Cl)}] \\
\text{and,} \\
\text{M.W. NaOCl} = 23 + 16 + 35.5 = 74.5
\end{align*}
\]

Now, the amount of hypochlorous acid (HOCl) produced by 1.0 mg/l Cl\(_2\) can be found by setting-up the equation’s known and unknown values along with the molecular weights as follows:

\[
\begin{align*}
\text{M.W.} = 71 & \quad \text{M.W.} = 52.5 \\
\text{Cl}_2 + & \quad \text{HOCl} + \\
1.0 \text{ mg/l} & \quad x
\end{align*}
\]

and, cross-multiplying and solving for “x”,

\[x = \text{mg/l HOCl} = 1.0 \text{ mg/l} \times \frac{52.5}{71} = 0.739 \text{ mg/l}\]
Then, by using the sodium hypochlorite reaction equation with water above, the amount of NaOCl it takes to produce 0.739 mg/l HOCl can be found as follows:

\[
\begin{align*}
M.W. &= 74.5 \\
NaOCl + \text{………………} &\rightarrow \text{HOCl} + \text{………………} \\
x &\quad 0.739 \text{ mg/l}
\end{align*}
\]

and, solving for "x", \(x = \text{mg/l NaOCl} = 0.739 \text{ mg/l} \times \left(\frac{74.5}{52.5}\right) = 1.05 \text{ mg/l NaOCl}.

Thus, 1.0 mg/l chlorine (as Cl₂) is equivalent to 1.05 mg/l sodium hypochlorite (NaOCl).

Summary

The chemical reaction equations presented herein represent much of the chemistry encountered at our facilities. A basic understanding of water chemistry is very important for all drinking water plant operators to have. It is hoped that this article has helped to take some of the fear and unknown out of this important subject matter.

Who’s got the best tap water in the world?

*Berkeley Springs, WV, Water Tasting Contest, February 26, 2011*

You can add best tap water in the world to the list of things Daytona Beach is internationally recognized for. A dozen judges at the 22nd Berkeley Springs International Water Tasting Contest spent Saturday February 26, 2011, tasting 99 waters from 23 states and 10 foreign countries. The judges gave Daytona Beach tap water the top prize as the world’s best municipal water. Daytona Beach also won the title in 2005. The water was judged on color, odor, taste and quench. *City of Kent, Ohio, came in fifth place.*

**Best Municipal Water 2011**
- Gold – Daytona Beach, Fla.
- Silver – Desert Hot Springs, Calif.
- Bronze – Santa Ana, Calif.
- 5th – Kent, Ohio

**Non-Carbonated Bottled Water 2011**
- Gold – Muskoka Springs, Jarratt, Ontario, Canada
- Silver – Pristine Springs, Clear Springs, Md.
- Bronze – Highbridge Springs, Wilmore, Ky.
- 4th – Almost Heaven, Manassas, Va. bottling Berkeley Springs water
- 5th – English Mountain Springs Water, Dandridge, Tenn.

**Purified Drinking Water**
- Gold: Texan Independence Water, League City, Texas
- Silver: Rain Fresh Oxygen Rich Purified Water, Garland, Texas
- Bronze: Mother's Finest, Reidsville, N.C.
- 5th -- Virginia Natural Water – Charlottesville, Va.

**Carbonated Bottled Water**
- Gold: Esperanza, Tesanj, Bosnia
- Silver: Mountain Valley Sparkling Water, Hot Springs, Ariz.
- Bronze: Tesanjski Dijament, Tesanj, Bosnia
- 4th -- Antipodes, Whakatane, New Zealand
- 5th -- Arctica, Marchand, MB, Canada

**The People’s Choice for Package Design**
- Gold: Tasmanian Rain, Tasmania
- Silver: Antipodes, Whakatane, New Zealand
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<td>Washington, DC</td>
<td>Annual Conference and Exposition</td>
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<td>Canton Drinking Water Workshop</td>
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*6 contact hours each*

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### 2011 Ohio Section Meeting

**September 20 - 23, 2011, at the Hilton Netherland, Cincinnati, Ohio**

#### Northwest District
- April 21 - Fostonia
- April 14 - Northern Expo
- July 14 - Put-in-Bay
- Oct 13 - Bowling Green

#### Southwestern District
- April 12 - Southern Expo
- May 16 - SW/SE Deer Creek
- July 14 - TBD
- Oct 14 - TBD

#### Northeast District
- April 14 - Northern Expo
- May 19 - Avon Lake
- TBD - Canton Workshop
- Oct 20 - Painesville

#### Southeast District
- April 12 - Southern Expo
- May 16 - SW/SE Deer Creek
- July 18 - Columbus
- Oct 21 - TBD

The Ohio Section Newsletter is the newsletter of the Ohio AWWA, published three times a year. Send comments, news notes, glossy / digital photos, and articles to:

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**Deadline for material to be in the 2011 newsletters are:**

Summer Issue - Jun 3 - Target mailing week of July 18
Winter Issue - Oct 7 - Target mailing week of Dec 5

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