Can Mixing Systems Help Prevent Aging Surface Water?

Natural Organic Matter Removal and Disinfection By-Product Reduction

Water Main Replacement Helps Greater Cincinnati
CASE STUDY

Winona's Wincrest Water Tank Continues to Perform Well

Installed: 2008
Tank Type: Composite Elevated Tank
Storage Capacity: 400,000 Gallons
Engineer: Short Elliott Hendrickson
Contractor: Engineering America

PROJECT OVERVIEW:
Engineering America crews completed the Wincrest water tower in August 2008 for the city of Winona, Minnesota. The 143-foot-tall structure has a capacity of 400,000 gallons and serves the far southwest quadrant of the city.

A life cycle maintenance analysis studied the cost of painting a welded steel water tower over a 50-year life cycle. City officials awarded the project based on a present worth analysis that showed a substantial savings by using Engineering America's Aquastore composite glass-fused-to-steel elevated tank.

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Disclaimer

The ideas, opinions, concepts, procedures, etc. expressed in this publication are those of the individual authors and not necessarily those of the MNAWWA section, its officers, general membership, or the editor. The mention of trade names for commercial products does not represent or imply the approval or endorsement of AWWA. This magazine is presented solely for informational purposes.
The dirt is flying and hydrants are flushing. It’s a nice change from beating frost and routine water plant maintenance. The primary reason I became involved with AWWA was assisting others in the Southwest operator schools. After this stint as Chair, it would be nice to get back to that more. Admittedly, part of the reason behind this is selfish. This reason is providing a relatively close opportunity for operators to obtain contact hours, take examinations, and not fall asleep. At the time this was written, the Metro and Southwest districts recently had their spring schools. It was reported the Metro school exceeded 250 attendees and the Southwest had 70. This is probably record (or near record) attendance for both. Thank you to the attendees, presenters, vendors, Minnesota Department of Health staff, and those who plan all our district schools.

Besides operator schools, Minnesota AWWA offers other opportunities. Some have already happened but there are many yet to come. This list doesn’t include all that happens within the councils and committees. It doesn’t include all the “hard” AWWA resources such as standards and other print or web based material. The events do offer another way for those in the industry to learn and grow.

**Water For People**
- 5K Run/Walk, August 14
- Motorcycle Ride, August 15

**Midwest Water Utility Management Institute**
The Institute was held March 10-13 at Hamline University and had maximum attendance. About ten years ago I had the opportunity to attend. To this day, it was three of the best days I’ve spent at a work-related function.

**AWWA Legislative Fly-In**
This year’s Fly-In was March 18-19 in Washington, DC. Pat Shea and Bill Schluenz represented the Minnesota Section.

**Regional Meeting of Section Officers (RMSO)**
The RMSO was April 24-25 in Chicago. The Minnesota Section had four members attending.

**Summer Leadership Workshop**
The Leadership Workshop is July 21-24 in Denver. The Minnesota Section will have six members attending.

**ACE**
The Association’s Annual Conference and Exposition is June 7-10 in Anaheim. This will be the first ACE for me, and, from what I’ve heard, it’s a must at least once. The convention center and hotel are across the street from Disneyland. For some awful reason I told this to my 8- and 10-year old daughters. It’s one of those things you want to retract immediately after saying it. They can’t believe ACE isn’t a kid’s event being so close to Disney. Since they can’t go I’m supposed to bring something back, “or be served with a side of ketchup.” Whatever that means is not quite certain.

**MN AWWA Annual Conference**
I’m saving the best for last. This year it will be September 15 -18 in Duluth. It’s tough to beat Duluth in September. Our Annual Conference has a great location, facility, events, and presentations. If nothing else, you’ll get to see Mr. Chair publicly speak. That’s what we’ll call it for now. A new tie might be in order. That will make tie number four. After that, the tie quota will be full—one tie per each decade of life.
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Congratulations! With your help, AWWA grew in 2014. The Association had a total membership of 50,173 as of 12/31/2014.

The Minnesota Section was a leader in membership recruitment in 2014 with a 1.3% increase! The Section represents 1.9% of AWWA's membership, ended the calendar year with a membership count of 955 (850 Individuals, 17 Utilities, and 88 Service Providers), and beat our membership goal...Yea! Only five sections reached their retention goal; unfortunately Minnesota Section missed its goal by two members but still had the fifth best retention rate.

The Minnesota Section, along with 17 other sections will be recognized and awarded incentive checks for accomplishing goals at the 2015 Membership Summit, February 4-6 in Denver, CO.
Message from the Editor

Stew’s thoughts

In early March, a dispute between North St. Paul mayor Mike Kuehn and council member Scott Thorsen almost escalated to the two duking it out in the parking lot after Kuehn asked Thorsen if he wanted to take it outside.

It’s good to know that Minnesota AWWA is more functional than North St. Paul, at least to the point that I’m not aware of the chair ever saying to the chair-elect, “Wanna take it outside, Bulldog?”

But even without Ali vs. Frazier, Minnesota AWWA meetings are fun and entertaining while being productive. I’ve been on the board a couple times—once as a council chair and the other time as secretary-treasurer. In terms of the three-hour meetings I’ve attended in my life, these have been among the more enjoyable.

Work gets done, business gets processed, actions get taken, but, even sans fisticuffs, a Minnesota AWWA board meeting mirrors the pleasure and satisfaction of the overall participation in the organization.

My predecessor as secretary-treasurer, Dave Brown, told a story of a board meeting he taped so he could review the proceedings as he wrote the minutes. His wife overheard some of the recording and said, “Wow, you guys have way too much fun.”

Fun and productivity are big parts of everything we do, and Minnesota AWWA does it as well as anyone or any organization.

I guess this is a call for volunteers, to join or get even more involved in carrying out our mission of providing safe drinking water and having a good time doing it. Whether serving on the board as a trustee or council chair or joining a committee or getting involved in an activity such as the annual Splash Dash, consider exploring the opportunities for participation.

The folks listed on the page with the table of contents will be happy to help you out in finding ways to get even more out of your AWWA membership.

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Board meeting highlights

Board Elections
The President-elect candidates were Michael Simpson (Indiana Section and AWWA Vice-President) and Jeanne Bennett-Bailey (Virginia Section and AWWA Public Affairs Council Chair). Jeanne is the Public Affairs Officer for Fairfax Water in Fairfax, Va., where she has worked in various capacities since 1981. Jeanne left Fairfax Water in 1999 to spend 2½ years working with AWWA on regulatory affairs, returning to Fairfax Water in 2002 as the Public Affairs Officer. Michael is the CEO of M.E. Simpson Company, Inc. in Valparaiso, Ind. He oversees the company as a whole, concentrating on financial management and business development.

Both gave thoughtful, compelling speeches; the Board voted Jeanne Bennett-Bailey as the next President-elect.

There were ten candidates for four open vice-president positions. The Vice-Presidents elected were Steve Dennis (Cal-Nevada Section), Jon Eaton (Minnesota Section), Martha Segal (Kentucky/Tennessee Section), and Brian Steglitz (Michigan Section). The elected VPs will join Brenda Lennox (Pacific Northwest Section) and Warner Palermo (Portico Section) as AWWA's vice-presidents.

Three candidates competed for one open Director-At-Large position; the Board elected Sally Mills-Wright (Texas Section).

Congratulations to all!

AWWA Trustee to the Research Foundation
Each year, the President-Elect of the American Water Works Association is responsible for appointing or reappointing a trustee to the Water Research Foundation’s Board of Trustees. In June 2015, the first term for Paul Rush will expire, and as such, he is eligible for reappointment. Paul has indicated his willingness to serve another term and as such has been reappointed.

AWWA Liaison to the Association of Boards of Certification (ABC)
The Association of Boards of Certification (ABC), formed by AWWA and WEF, is an organization through which certifying authorities may communicate and cooperate in order to better fulfill its responsibility to ensure competence of employees of environmental occupations and laboratories. The 2011 Memorandum of Understanding with ABC states that AWWA will appoint one of its members with experience in certification programs to serve as the official liaison between AWWA and ABC for a two-year term, with a three term limit. Laurie Dougherty is currently serving her first term which ends in June 2015 and has indicated her willingness to serve another term.

Section Allotments
Section Allotments for 2015 are calculated as 18% of the dues received for the period of September 1, 2013 through August 31, 2014. The Minnesota Section collected $168,665 in dues during the period. The 2015 approved allotment will be $30,360.

Section Assessments
In order to levy an assessment, 35% of a Section’s membership is required to vote in an assessment “referendum,” with two-thirds of those voting approving the assessment. If an assessment was approved by this method, future changes to the amount of the assessment could be determined by a vote of the Section’s Board of Trustees rather than of the whole membership.

Michigan and Ohio sections have raised a concern, stating the 35% or greater membership vote with a two-thirds approval could be too high of a threshold to meet. The Association Board will review the assessment approval percentage as part of the 21st Century Membership Model discussion.

Business Plan Updates
AWWA CEO David LaFrance presented updates on various initiatives and where they fit in the 2015 Business Plan (attached).

The AWWA Staff Business Plan is built upon department business plans (Five-Year Financial Model, International Strategic Plan, Membership Strategic Plan, Convention and Education Plan, Publishing Strategic Plan and the AWWA Technology Roadmap), organized by the strategic objectives found in the AWWA Strategic Plan, and summarizes the actions and goals that will be undertaken in 2015.

AWWA2020: A Path to One AWWA - Update
A resolution was adopted and approved by the Board in June 2014. The resolution views AWWA is the collective “Association” AND “Section” (“We Are One”). In addition, the resolution presents a vision and general guidance of how the association wants to operate in 2020 (the future).

The “Path to One AWWA” is broken into five strategic themes. Each theme was discussed by subject matter committees (SMCs...pronounced “smacks”). Below are the themes and some related programs/ideas.

Communication
• Timely, meaningful information/feedback will better align AWWA

Education
• EPA Grant (a model for the future – association makes and sections deliver content)
• Water X – Water Training and Educational Resource Exchange
• Education material inventory
• Cost sharing of intellectual property (how will that work?)

Branding
• Common logos to make AWWA look alike
• Members will know they are connected with AWWA content
• Everyone is united around mission and vision

Membership
• Members ARE part of the association and section (“We Are One”)
For over 35 years, Prinsco has been developing more than just plastic pipe. We’ve been developing a reputation that’s founded on one simple thing: INTEGRITY. It’s how we design our products, it’s how we treat our customers, it’s how we do business.

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Governing Board Highlights

- Clear and coordinated efforts to gather and retain members
- Membership guide (to be re-launched at the membership summit)

**Finance**
- Resources put to the most efficient use
- Association has a bigger buying power – can extend this to sections
  - Conference decorating
  - Business materials and supplies
  - Printing
- Member management software

The Minnesota Section has completed the branding and strategic plan alignment.

**21st Century Membership Model Structure**

There was much discussion about the membership structure, its multiple options, and the confusion it creates for people looking to join or think they are members because their employer is either a Service Provider or Utility member. Everyone agreed that simplifying the structure would help but not to move away from the hybrid-membership structure (Individual, Utility, or Service Provider). Additional feedback was provided so a refined discussion can take place at June 2015 AWWA Board Meeting.

A little counter to the previous discussion, the Board approved adding an “International Member.” Currently, a member is not defined by his or her location of residence or business. Members residing outside of North America have typically represented one to two percent of total membership numbers. That statistic will change as AWWA extends its global focus. The new member designation will allow adjustable dues rates and benefits based on business and economic factors (World Bank economic indicators). Growth in new international markets, supported by the appropriate member structure for retention, would provide a greater likelihood of Association growth in terms of both finances and member count.

**Total Water Solutions**

At the June 2013 AWWA Board meeting, a new strategic plan was adopted that included the following new strategic objective for AWWA: “Expand the Association’s knowledge resources to include additional drinking water and total water solutions in response to member needs.”

To the Association, this means the development of knowledge resources not only in the core focus area of drinking water but also in the areas of wastewater, water reuse, and storm water. This decision was made because drinking water, wastewater, reuse, and storm water management is very closely linked in today’s world. Many water utilities provide a range of services including drinking water production, wastewater collection/treatment, and storm water management. Treated wastewater and storm water is not only discharged into our drinking water supplies but is also being looked at as a valuable resource on its own – either to supplement an existing water resource portfolio or to supplant a currently unsustainable supply. In addition, reuse water is a viable alternative for many utilities.

Staff continue to promote and monitor key metrics on this relatively new initiative (strategic planning, conferences, resource communities, technical programming, and standards)

**India Initiative**

Uma is currently in India with other executive AWWA staff presenting information on the Association and will write an initiative update in the upcoming Breeze.

**Standard and Policy Updates…**

Twenty-three standards were approved.
1. B102 Manganese Greensand for Filters
2. B112 Microfiltration and Ultrafiltration Membrane Systems
3. B116 Electrodialysis and Ion-Exchange Membrane Systems
4. B305 Anhydrous Ammonia
5. B306 Aqua Ammonia (Liquid Ammonium Hydroxide)
6. B512 Sulfur Dioxide
7. C213 Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings
8. C216 Heat-Shrinkable Cross-Linked Polyolefin Coatings for Steel Water Pipe and Fittings
9. C229 Fusion-Bonded Polyethylene Coatings for Steel Water Pipe and Fittings
10. C507 Ball Valves, 6 In. Through 60 In. (150 mm through 1,500 mm)
11. C560a Cast Iron Slide Gates
12. C606 Grooved and Shouldered Joints
13. C700 Cold-Water Meters—Displacement Type, Metal Alloy Main Case
14. C701 Cold-Water Meters—Turbine Type, for Customer Service
15. C702 Cold-Water Meters—Compound Type
16. C703 Cold-Water Meters—Fire-Service Type
17. C704 Propeller_Type Meters for Waterworks Applications
18. C708 Cold-Water Meters—MultiJet Type
19. C710 Cold-Water Meters—Displacement Type, Plastic Main Case
20. C712 Cold-Water Meters—SingleJet Type
21. C713 Cold-Water Meters—Fluidic-Oscillator Type
22. C906 Polyethylene (PD) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm through 1,600 mm), for Waterworks
23. G200 Distribution Systems Operation and Management

Five policy statements were revised and approved.
1. Assignment of the Continuing Education Unit and Professional Development Hour Policy
2. Emergency Preparedness & Security Policy
3. Employee Compensation
4. Protecting the Allocation of Surface Water Reservoir Storage Capacity and Yield for Water Supply Purposes
5. Regional Collaboration by Water Utilities -
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The key goals of an asset management (AM) program are to maintain an acceptable level of service, maximize the useful life of infrastructure, and minimize life-cycle costs. As water utilities implement their AM programs, they are faced with the challenges of rehabilitating and replacing aging water mains. In the process of addressing these needs, “each utility’s objective is to make these investments at the optimal time for maintaining current service levels and to avoid replacing pipes while the repairs are still cost-effective.” (AWWA, 2012) Thus, two common hurdles these utilities encounter are determining the most cost-effective replacement rate and targeting the appropriate pipes for replacement.

Few water utilities have analytical processes in place that allow them to accurately measure the effectiveness of their water main replacement program (WMRP) to validate or improve upon the decision process by which water mains are selected and prioritized for replacement. Nonetheless, in order to optimize an AM program and ensure adequate ongoing funding, a defensible evaluation of a WMRP’s effectiveness is important. Assessing failure causes, failure trends, risk factors, and impact of replacement efforts can improve understanding of replacement dynamics and better inform decision-making. A well-tuned selection process for water main replacement helps maximize system reliability, minimize premature pipe replacements, and reduce life-cycle costs.

“… a crucial responsibility for utility managers now and in the future is to develop the processes to continually improve their understanding of the ‘replacement dynamics’ of their own water systems. Those dynamics should be reflected in an Asset Management Plan (AMP) and, of course, in a long-term capital investment plan.” (AWWA, 2012)

The GCWW story
This article reviews the successful effectiveness evaluation that was conducted by Hazen and Sawyer (New York, New York) for Greater Cincinnati Water Works (GCWW), a large water utility with 3,100 miles of water main. GCWW is owned and operated by the city of Cincinnati and serves a population of approximately 1.1 million through 247,000 retail and wholesale customer accounts in five counties within southwest Ohio and northern Kentucky (Figure 1).
The pipes in GCWW's system are up to 150 years old with an average age of 46 years (Figure 2). GCWW has long recognized the importance of good asset management practices, including an ongoing WMRP, to help reduce occurrences of main failures and to prevent a significant increase in failure rates as pipes age. As such, GCWW has maintained water main failure records and employed a proactive WMRP for 30 years while making a significant investment in replacement of aging and deteriorating water mains through its WMRP.

GCWW’s process for selecting and prioritizing mains for replacement has evolved since it began an organized, proactive program to replace aging and deteriorating water mains in 1985. Prior to that time, water main replacement was strictly reactionary based on emergency water main repairs. Initially, budget constraints limited water main replacement projects to an annual replacement rate around 0.25 percent of the entire distribution system. The goal was to address the worst maintenance problems, usually limited to a few individual streets. In the late 1980s, as a result of an effort by the mayor and council to restore the condition of the city’s assets, GCWW began to target an annual water main replacement rate of 1 percent. Replacement rates since the early 1990s have averaged slightly below the 1 percent goal. Today, the WMRP budget allows GCWW to both react to failures and to actively plan the future of the water distribution system. Projects in the program now are multi-street projects which address more than just maintenance, but can also help with flow issues, system upgrades, etc. In the past 10 years, the average replacement rate has been 0.95%; and the 1% goal has been exceeded three times (Figure 3).

Evaluating water main failure rates
For purposes of evaluating the effectiveness of GCWW’s WMRP, failure rates (including both breaks and leaks) were normalized (to number of failures per 100 miles of pipe) by pipe attributes (such as material, diameter, and installation decade) and by spatial attributes (such as soil corrosiveness and operating pressure) in order to identify failure causes and trends. This allowed GCWW to better understand which factors most influence water main failure rates in its system, identify recent failure trends for individual pipe classes, and evaluate the effectiveness of nearly 30 years of water main replacement efforts.
Failure rates from 1985–2003 trended upward (Figure 4). The analysis showed that the failure rates increased substantially in 1994, but this is likely due to better record-keeping as an electronic recordkeeping system was implemented and fewer breaks and leaks went unlogged. Except for 2007, which had atypical weather conditions (discussed later), failure rates have been trending downward in the last 10 years (Figure 4) as a result of more aggressive main replacement spending—especially in 2003 and 2004 (Figure 3). Since inception of the WMRP, the average failure rate has been 24 failures per 100 miles of pipe; but failure rates were reduced to 16 or less in 2012 and 2013 (the most recent year for which complete data are currently available), which is in line with the top quartile of comparable large water utilities. (AWWA, 2014)

The detailed analysis confirmed information that was already known either intuitively or from previous reviews, but it also revealed several new discoveries and clarified some prior misunderstandings about which pipes were failing at the highest rates. Ninety-eight percent of the water main failures in GCWW’s system have been on gray cast iron pipes, which still account for the majority of piping in the system, despite ongoing efforts to replace cast iron with ductile iron piping (Figure 5). Sixty-four percent and 25 percent of failures, respectively, have been on six-inch and eight-inch diameter pipes (Figure 6); and 60 percent of failures have been on pipes with leadite joints. There are at least two reasons for high failure rates associated with leadite joints: “First, leadite has a different coefficient of thermal expansion than cast iron and results in additional internal stresses that can ultimately lead to longitudinal splits in the pipe bell. Secondly, the sulfur in the leadite can facilitate pitting corrosion resulting in circumferential breaks on the spigot end of the pipe near the leadite joint. The failure rate in the industry for leadite joint pipe is significantly higher than for lead joint pipe even though the pipe may not be as old.” (American Water Works Service Co., Inc. 2002, p3)

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**Figure 3. GCWW Annual Water Main Replacement**

**Figure 4. GCWW Annual Water Main Failure Rates**

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Pipe vintage – not to be confused with age

An interesting finding of the evaluation was that pipe vintage (e.g., decade installed) affects failure rates more than does pipe age. In particular, pipe installed in the 1940s has, on average over the past 30 years, had a significantly-higher failure rate than pipe installed in any other decade. Thus, as the system has aged over the last three decades, the median pipe age at failure (Figure 7), i.e., considering all failures to date, has increased from approximately 48 years to approximately 53 years as a result of very low failure rates in pipes installed over the last five decades (Figure 8).

Another observation of note is the average failure rate of 3.67 failures per 100 miles for pipes installed in the current decade (Figure 8), which is relatively high compared to pipes installed during the previous three decades. This is due to the high failure rate that sometimes occurs right after installation, when failures are typically associated with material defects and poor installation. The same phenomenon occurred in the 1990s with pipe installed during that decade. This effect is described as the ‘burn-in’ phase by Kleiner and Rajani, who note, “The life cycle of a typical buried pipe is often described by a so-called ‘bathtub curve’ … [which] often distinguishes between three phases in the life of a pipe. The first phase, also known as the ‘burn-in’ phase” (Kleiner et al, 2001).

Climatic and environmental impacts

Climatic conditions—particularly sustained very-low temperatures or sustained hot, dry weather—were found to have a significant effect on main failure rates. A seasonal trend (Table 1) is clearly evident in the historical failure data. Failures occur most frequently in December, January, February, July, and August. Individual years with very high failure rates can often be attributed to a very cold period in the winter and/or hot, dry weather in the summer. For example, 2007 was atypical with an unusually cold winter and prolonged hot, dry weather in late summer, which resulted

Figure 5. GCWW System Composition by Water Main Pipe Material

Figure 6. GCWW System Composition by Water Main Pipe Size
in particularly high failure rates in February, March, September, and October (Table 1). GCWW staff have observed that main failure rates increase dramatically once water temperatures fall below approximately 38–39 degrees Fahrenheit, which occurred in February 2007, when the area experienced three consecutive weeks of average ambient temperatures below 22 degrees Fahrenheit and again in early 2014. This phenomenon is discussed in a report by American Water Works Service Co., Inc. (American Water Works Service Co., Inc., 2002, p12)

Environmental conditions such as soil corrosiveness and frost potential also affect water main failure rates. Using NRCS soil map shapefiles, corresponding soil attributes were spatially joined to the failure records. As expected, there has been a correlation between soil corrosiveness and pipe failure rates. Since the majority of GCWW’s distribution network is located in highly corrosive soils, this is particularly disconcerting. However, in the past three years the correlation between failure rates and soil corrosiveness has been decreasing, which is thought to be the result of using polyethylene encasement on all new iron pipe, which has been GCWW’s standard since 1977. Hopefully, this practice will eventually eliminate the correlation between soil corrosiveness and water main failures.

Other findings
For purposes of this study, failures were classified as either breaks or leaks as follows:

- **Breaks** – Circumferential cracks, longitudinal cracks, bell cracks, and corrosion holes.
- **Leaks** – Joint leaks due to rusted bolts or failed gaskets/joint material, leaks at couplings or clamps, and leaks at connections between two pipelines (e.g., tee, tapping sleeve, etc.).

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An unexpected finding of the study was that water main breaks occur much more frequently than leaks among known failures, with five times as many break records as leak records in recent years. Also, the majority of the failures (greater than 54%) were circumferential or longitudinal cracks, and fewer than 20% of failures were attributed to corrosion (Figure 9).

Although most pipe classes have followed the overall trend of decreasing failure rates, there are some exceptions. Figure 10 shows one example of a community where the failure rate has actually increased in the last couple years.

Recordkeeping and other best practices
Through this evaluation, the importance of compiling accurate, complete, and consistent records of all pipe failure incidents was very apparent. These records are essential to a proper understanding of historical failures, risk factors, and the effects of water main replacement efforts. Not only do these records allow a utility to identify and understand the pipe attributes and risk factors that most influence pipe failure rates in its system, but they also provide the means by which to analyze the impact of water main replacement efforts over an extended period of time. In order to manage the data most efficiently and ensure maximum usefulness, each failure record should include at least the following information:

- Failure date
- A unique Failure ID
- GPS coordinates
- Unique pipe Asset ID (e.g., from GIS or CMMS)
- Classification of failure, using standardized terminology
- Pipe attributes

<table>
<thead>
<tr>
<th>Month</th>
<th>1985 – 2013 Average*</th>
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* Excluding 2007

Table 1. GCWW Water Main Failures by Month, Average vs. 2007

Figure 9. GCWW Water Main Failures by Failure Type

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Some other lessons learned through this evaluation were: 1) water main replacement should not be prioritized based solely on pipe age; 2) do not be misled by the quantity of failures in a certain pipe class, when that pipe class represents a majority of the system—i.e., consider failure rates; and 3) it is important to identify and track all costs for emergency repairs in order to weigh these costs versus the cost of main replacement.

The future
GCWW has already successfully used the results of their WMRP effectiveness evaluation to influence their WMRP budgeting process and refine the process by which water mains are targeted and prioritized for replacement. The findings of this study will help maintain ongoing support for the WMRP and improve the program’s efficiency. As budgets allow, future activities to enhance the study may include:

• Investigate pipe classes with above-average failure rates.
• Investigate pipe classes with a recent increase in failure rate.
• Investigate how system and operational changes have impacted failure rates.
• Investigate the impacts of pipe rehabilitation on failure rates.
• Estimate failure curves for major pipe classes.
• Assess risk of failure (i.e., likelihood and consequence) for individual water mains.
• Determine target level(s) of service and key performance indicators related to main failures and replacement efforts.
• Predict long-term water main replacement funding needs.

Acknowledgements
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References
American Water Works Association (AWWA) (2012), Buried No Longer: Confronting America’s Water Infrastructure Challenge.
AWWA Partnership for Safe Water Distribution Program (2011), Distribution System Optimization Program (Overview).
Municipal Engineering for Greater Minnesota Communities.

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Can Mixing Systems Help Prevent Aging Surface Water?

By Erika Henderson, Director of Research
Pittsburg Tank & Tower

In the past, many water operators thought daily turnover and fluctuation of volume was enough to mix the water in a storage tank. Today, research and tests are showing more effort may be needed to effectively mix storage tank water and improve water quality. Several water tank features can contribute to how effective water is mixed and the rate at which it ages.

A tank’s design, daily use, and location in the system should all be considered when deciding the best action for improving water quality. Tanks with high height to diameter ratio, such as standpipes, are more susceptible to aging surface water because greater water variations can develop among the many layers. As the distance between surface and bottom water increases, more effort is required for the bottom layers to reach the distant top layers. Same thing applies when inlet and outlet pipes are both placed in the bottom ring of a tank: the new incoming water is also the first to exit the tank while surface water is left to continue aging. However, if the inlet pipe is extended to allow over-the-top filling, then surface water can be pushed to the bottom and mixed with incoming water.

“Water quality is a significant concern to water distribution system managers. Disinfection by-product (DBP) formation is largely dependent on reaction time, and it can continue for several days within the distribution system. At the same time, disinfectant residual must be maintained throughout the most remote components of the system to ensure pathogen-free water. Managing the residence time of water within storage tanks is one practice available to minimize water age within the distribution system. Water system managers and engineers should consider the need for circulation of water and residence time management within storage tanks during the design phase.” AWWA M42

Although, water quality and circulation are often discussed during the design phase, they are continuing concerns for water operators. Deaths and illnesses occur daily from unhealthy water, and water operators can lose their license to operate a water system if unhealthy water is found in their system. Great responsibility comes with being a water operator and many pride themselves on providing excellent water quality. A popular method for improving water quality is to install a mixing system. Mixing systems can help prevent aging surface water that often leads to stratification, accumulation of disinfectant by-products, water quality loss and ice formation.

Stratification

Stratification occurs when water has become separated into layers. Layers are arranged according to density, and density differences are created when variations of water temperature or pH exist. The warmer, less dense, older water sits above the cooler, denser, new water coming in creating layers. The incoming water stays near the bottom and is also the first to exit the tank if an over-the-top fill has not been installed. The top layer of older water is left to age even further. As water ages, the quality deteriorates and bacterial growth increases. The bacteria may not cause sample problems in the warmer months, but may show up when the older, surface water begins to cool and sink to the bottom in the cooler months.

Water temperature can be checked every five foot during an inspection to help determine whether stratification is a problem. If stratification is an issue, then a mixing system may be needed. Mixing systems should be designed according to the tank’s unique dimensions and needs. Most are designed to take the denser, newer water from the bottom and mixing it with the less dense, warmer surface water. Mixing helps maintain consistent water temperatures and pH levels throughout the tank thus preventing stratification. However, mixing must occur regularly to prevent reoccurring stratification, sample inconsistencies and inaccurate disinfection treatment.
Disinfectant By-Products

Disinfectant decay occurs when chemicals used for disinfection react with other organic material, organisms, and surfaces. These reactions create carcinogenic disinfectant by-products known as Trihalomethanes (TTHMs) and halo-acetic acids (HAAs). By-products are present in almost all chlorinated water supplies, but the key is keeping these levels as low as possible. Mixing systems can help keep these levels low by effectively blending all water with disinfectants increasing the contact time. When disinfectant contact time is increased less chlorine concentration is needed and thus fewer by-products are produced.

Ice Formation

Most compounds become denser as they change from a liquid to a solid because the molecules become more tightly packed. But water is most dense at 39.2°F (4° C), and becomes less dense at lower temperatures causing ice to float. Water in a tank is the same and according to NFPA 25, “the temperature of water tanks shall not be less than 40°F (4.4°C).” When temperatures fall below freezing, ice can form on the surface. The ice will continue to expand and get thicker as the water temperature remains below freezing. Ice can cause serious damage to a tank: tank coatings are often damaged, pipes can become clogged, leaks and structural damage can result, and even tank failures have occurred from ice forming in water tanks.

“When a tank freezes, one or more of the following conditions usually results and cause leakage.

• Inside overflow or other piping breaks occur.
• Ladders or other attachments to the container are pulled out by ice, making a hole at the point of attachment.
• Ice pressure can expand and place hoop stress loads on the steel and seams, which may cause the tank wall to yield or burst.
• Leaks due to corrosion become apparent.” AWWA M42

Mixing systems can provide regular water circulation to help maintain a consistent water temperature above freezing and prevent the water from separating into layers where dangerous ice can form on the surface and sides of tanks.

Maintaining Water Quality

All tanks should be regularly monitored for mixing efficiency, but tanks with low filling cycles, high volume, or at the end of a water system should be monitored more often. These types of tanks may not only require mixing system upgrades, but may also require more frequent inspections and cleanings to maintain water quality and reduce aging surface water. Mixing systems can help prevent aging surface water, but they must be designed and installed properly to be effective. A reputable tank company with knowledge and experience in these types of upgrades should be contacted to perform the work. For further information on water tanks and mixing systems please contact Don Johnston at 270-748-1343 or djohnston@watertank.com.

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Microsand ballasted clarification has long been used in drinking water treatment as a means for turbidity and total organic carbon (TOC) removal. However, further reduction of disinfection by-products (DBPs) has been hampered due to the inability to remove TOC with coagulation, flocculation, and settling alone. With the addition of powdered activated carbon (PAC) into a pre-contact chamber ahead of the ballasted clarification system, adsorption properties aid in the removal of the natural organic matter (NOM) and in turn help to meet U.S. Environmental Protection Agency (EPA) limits for DBPs. PAC is an extremely porous material as a result of the activation step, and a single particle can range in size from 1–150 micrometer (μm). A single gram of activated carbon can have a surface area in excess of 500 m². By recycling the PAC back through the system to an upfront contact tank, versus single pass PAC dosing, further use of the PAC adsorption capacity can be achieved, thus lowering operating costs associated with DBP reduction.

Figure 1. Microsand Ballasted Clarification with PAC Recycle Flow Diagram
Breeze | Summer 2015

Microsand Ballasted Clarification with Powdered Activated Carbon

Process description
The microsand ballasted clarification system with PAC recycle includes typical coagulation, flocculation, and settling tanks with the addition of a PAC pre-contact tank upstream of the coagulation basin (Figure 1). Within the PAC pre-contact tank, fresh PAC is added at the inlet at a dose of 5–30 milligram/liter (mg/L). Recycled sludge and PAC is also re-injected back to the process in the pre-contact tank which has a hydraulic retention time of 8–10 minutes. The solids content within the pre-contact tank is maintained at 1–2 g/L by controlling the PAC waste rate. After exiting the PAC contact tank, flow enters the coagulation basin with a retention time of 2–3 minutes. Coagulant is injected into the coagulation basin where rapid mixing is occurring and micro-flocs are beginning to form. Flow then enters the flocculation basin for a retention time of 3–4 minutes. Here, microsand ballast is re-injected back into the process from the hydrocyclone where it was separated from the sludge. A polymer is also added to bind the flocs to the ballast in order to aid in settling.

Once leaving the flocculation basin, flow enters the settling tank where the ballasted floc settle to the bottom and are collected by a scraper mechanism, and clarified water exits the process via lamella settlers and overflow weirs. Solids at the bottom of the tank are then extracted through a slurry pump and recirculated to a hydrocyclone that separates the microsand ballast from the PAC and sludge. The PAC and sludge are sent to a PAC waste tank where a small waste stream is pulled from the waste tank at a rate of roughly 0.1% of the raw water flow and the rest of the flow is returned to the pre-contact tank. The waste stream will increase or decrease in order to maintain a system solids concentration within the PAC pre-contact tank.

Nashville, TN: Pilot testing
Pilot testing was conducted in Nashville, TN at the Harpeth Valley Utility District (HVUD) Water Treatment Plant in late 2011. The plant currently has a rated capacity of 51 million gallons per day (mgd). The goals of the pilot testing were to maintain effluent TOC levels below 1.0 mg/L while reducing DBPs to less than 48 μg/L Trihalomethanes (THM’s) and less than 36 μg/L Haloacetic Acids (HAA5). Pre-sedimentation basin effluent served as the water source for the pilot.

The pilot was optimized using different fresh PAC doses ranging from 10–30 mg/L. The PAC contact tank total suspended solids (TSS) were monitored and ranged from 1.0–2.0 g/L. Table 1 shows the TOC results observed during the fresh PAC optimization testing. During this portion of testing it was determined that a target of 15–20 mg/L of fresh PAC would provide the best TOC removal while minimizing operating costs.

Following optimization of the PAC within the system, a 35-day extended run test (Figure 1) was performed as fresh PAC was added to the raw water stream ahead of the pre-contact tank at a dose of 18–19 mg/L. TSS was monitored in the pre-contact chamber with a target value of 1,000 mg/L which served as the system PAC concentration. As flow exited the pre-contact tank, Aluminum Chlorohydrate (ACH) was fed at a dose of 18–19 mg/L. TSS was monitored in the pre-contact tank where the ballasted floc settle to the bottom and are collected by a scraper mechanism, and clarified water exits the process via lamella settlers and overflow weirs. Solids at the bottom of the tank are then extracted through a slurry pump and recirculated to a hydrocyclone that separates the microsand ballast from the PAC and sludge. The PAC and sludge are sent to a PAC waste tank where a small waste stream is pulled from the waste tank at a rate of roughly 0.1% of the raw water flow and the rest of the flow is returned to the pre-contact tank. The waste stream will increase or decrease in order to maintain a system solids concentration within the PAC pre-contact tank.

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Table 1. Nashville, TN Fresh PAC Optimization

Figure 2. Nashville, TN Extended Run TOC Results

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Table 2. Nashville, TN DBP Results

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Currently, HVUD is in phase one of a four phase expansion that will provide a 23 mgd microsand ballasted clarification system with PAC recycle ahead of microfiltration (MF) hollow fiber PVDF membranes, with outside-in flow pattern, for removal of TOC and reduction of disinfection by-products. This system is scheduled for commissioning in 2015.

Springhill, TN: Pilot testing
Pilot testing was conducted in Springhill, Tennessee, at the Springhill Water Treatment Plant in early 2012. The plant currently has a rated capacity of 4 million gallons per day (mgd). The goals of the pilot testing were to improve effluent TOC levels while reducing DBPs to fewer than 80 μg/L Trihalomethanes (TTHMs) and fewer than 60 μg/L Haloacetic Acids (HAA5). The pilot was optimized using different coagulants and fresh PAC doses ranging from 10–20 mg/L. The PAC contact tank total suspended solids (TSS) were monitored and ranged from 1.0–2.0 g/L. Table 3 shows the TOC results observed during the fresh PAC and ferric chloride optimization testing. During this portion of testing it was determined that a target of 20 mg/L of fresh PAC would provide the best TOC removal. During the pilot study, DBPs were spot sampled using different coagulants for comparison. The results (Table 4) showed that all coagulants tested were able to meet the goals set forth of fewer than 80 μg/L TTHM and fewer than 60 μg/L HAA5.

**“Microsand ballasted clarification with PAC recycle has been accepted as a drinking water treatment alternative for removing TOC and reducing DBPs.”**

Fayette, GA: Pilot Testing
Pilot testing was conducted in Fayette, GA in mid-2010. The goals of the pilot testing were to improve effluent TOC levels while reducing DBPs to fewer than 80 μg/L Trihalomethanes (TTHMs) and fewer than 60 μg/L Haloacetic Acids (HAA5).
Microsand Ballasted Clarification with Powdered Activated Carbon

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<th>PAC Setup</th>
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<th>Coagulant (mg/L)</th>
<th>TTHM (µg/L)</th>
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Table 5. Fayette County, GA DBP Results of PAC Single Pass vs. Recycle

The pilot was operated on plant raw water from a nearby reservoir. During the pilot, fresh PAC was added to the raw water stream ahead of the pre-contact tank at a dose of 10–30 mg/L. TSS was monitored in the pre-contact chamber with a target value of 1–2 g/L. As flow exited the pre-contact tank, aluminum sulfate was fed at a dose of 15–20 mg/L as product. A dry anionic polymer was fed into the flocculation zone of the ballasted clarification system at a dose of 0.60–0.90 mg/L. PAC was recycled back to the pre-contact chamber and used PAC was wasted to maintain a steady system concentration. Average settled water turbidity was maintained at < 1 NTU while operating at system hydraulic overflow rates of 10–16 gpm/sf. Testing was also conducted to compare PAC recycle to single pass dosing and the results can be seen in Table 5 below.

DBP results showed that similar TTHM and HAA levels could be achieved with a lower fresh PAC dose and lower coagulant dose when using the PAC recycle versus a single pass of dosing and wasting.

Conclusion

Microsand ballasted clarification with PAC recycle has been accepted as a drinking water treatment alternative for removing TOC and reducing DBPs. Numerous pilot studies and data confirm that a ballasted clarifier with PAC recycle is significantly more efficient than single pass PAC dosing with respect to overall PAC usage. The pilot data also shows NOM removal capabilities in limiting DBP formations. With the increased utilization of the adsorption capacity of PAC through recycle, significant operational savings can be achieved when trying to reduce DBPs and remove natural organic matter.

“Numerous pilot studies and data confirm that a ballasted clarifier with PAC recycle is significantly more efficient than single pass PAC dosing with respect to overall PAC usage.”
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<td>Sioux Falls Public Works</td>
<td>P: 651-304-0960</td>
<td><a href="mailto:petermoulton@siouxfalls.gov">petermoulton@siouxfalls.gov</a></td>
</tr>
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<td>Mark Nelson</td>
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<td><a href="mailto:marknelson@ci.mpg.mn.us">marknelson@ci.mpg.mn.us</a></td>
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<td><a href="mailto:shawn.mulhern@ci.newfolden.mn">shawn.mulhern@ci.newfolden.mn</a></td>
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<td><a href="mailto:cnelson@ci.sauk-rapids.mn.us">cnelson@ci.sauk-rapids.mn.us</a></td>
</tr>
<tr>
<td>Shawn Nelson</td>
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<td><a href="mailto:Shawn.nelson@ci.oakdale.mn.us">Shawn.nelson@ci.oakdale.mn.us</a></td>
</tr>
<tr>
<td>Kimberly Nelson</td>
<td>Waterways Water Technologies</td>
<td>P: 763-323-3560</td>
<td><a href="mailto:Kimberly.Nelson@waterways.com">Kimberly.Nelson@waterways.com</a></td>
</tr>
<tr>
<td>New Prague Utilities Commission</td>
<td>310 1st St N</td>
<td>P: 507-359-6279</td>
<td><a href="mailto:Newpragueservices@cyv.com">Newpragueservices@cyv.com</a></td>
</tr>
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<td>City of Plymouth</td>
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<td>Michelle Nicosa</td>
<td>Saint Paul Regional Services</td>
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<td><a href="mailto:michelle.nicosa@cyv.com">michelle.nicosa@cyv.com</a></td>
</tr>
<tr>
<td>Diane Nielsen</td>
<td>Minnesota Water Works</td>
<td>P: 612-691-2505</td>
<td><a href="mailto:dhelen@cyv.com">dhelen@cyv.com</a></td>
</tr>
<tr>
<td>Adrian Nino De Rivera Frost</td>
<td>15504 McGee RD W</td>
<td>P: 713-932-2332</td>
<td><a href="mailto:adrianino@deivera.com">adrianino@deivera.com</a></td>
</tr>
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<td>Brian Noma</td>
<td>Minnesota Dept. of Health</td>
<td>P: 507-645-8062</td>
<td><a href="mailto:Brian.Noma@state.mn.us">Brian.Noma@state.mn.us</a></td>
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</tbody>
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P: 218-631-5734

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Minneapolis, MN 55606-2545
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Richard.Wagner@AE2S.com

Justin Wagner
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Richard.Wagner@AE2S.com
P: 218-855-5115

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mwallis@sehinc.com
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Michael Waak
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Wendy Wemple
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Truro, MA 02666

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Wiss & Associates

Josh Xiong
LiTech NA

Marvin Wurzer

Marvin Wurzer

Maxwell Water Technologies

Metrostar Water Technologies LLC


Winefred Wurzer

City of Winona
Mike Zaborowski

City of Winona
Mike Zaborowski

City of Winona

Worthington Public Utilities

Wright Water Technology

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Categories

Accessories
General Repair Service
Mid America Meter, Inc.

Activated Carbon
CEI-Carbon Enterprises Inc.

Algae Control
Medora Corporation, home of SolarBee and GridBee brands

AMR Systems and Meters /AMI Solutions
Ferguson Waterworks
HD Supply Waterworks
Mid America Meter, Inc

Anthracite
CEI-Carbon Enterprises Inc.

Backflow Prevention Programs
HydroCorp

Chemical Processing & Feed Systems
Pollardwater.com

Contractors
Bergerson Caswell Inc
Hydro-Klean
Interstate Companies

Cross Connection Control
HydroCorp

Dechlorination
Pollardwater.com

Design-Build Contractor
Bergerson Caswell Inc
Black & Veatch
Brown and Caldwell

Electrical Instrumentation/Controls/Generators
Mid America Meter, Inc
Minnesota Pump Works
Titan Energy Systems Inc.
Ziegler Power Systems

Engineers/Consultants
AE2S
AECOM
Apex Engineering Group
Banner Associates, Inc.
Black & Veatch
Bolton & Menk, Inc.
Brown and Caldwell
Dixon Engineering, Inc.

HR Green, Inc.
KLJ
Leggette, Brashears & Graham, Inc.
Moore Engineering, Inc.
Progressive Consulting Engineers, Inc.
Short Elliott Hendrickson Inc. (SEH)
Stantec Consulting Services
Summit EnviroSolutions, Inc.
Tonka Water

Filters
CEI-Carbon Enterprises Inc.
Filter Media Remove/Supply & Install
CEI-Carbon Enterprises Inc.

Filtration
CEI-Carbon Enterprises Inc
Hawkins Water Treatment Group
Progressive Consulting Engineers, Inc.
Tonka Water
Van Bergen & Markson, Inc.
Vessco, Inc.

General Industrial
Hydro-Klean
Professional Workforce Training

GIS
AE2S
Bolton & Menk, Inc.
Moore Engineering, Inc.
Stantec Consulting Services
Summit EnviroSolutions, Inc.

Greensand Plus
CEI-Carbon Enterprises Inc.

Industrial Wireless Data Communications
Short Elliott Hendrickson Inc. (SEH)

Inspector/Locators
Pollardwater.com

Land Surveying
AE2S
KLJ
Moore Engineering, Inc.
Stantec Consulting Services
Widseth Smith Nolting

Leak Detection/Correlator Services
M.E. Simpson Co., Inc.
Water Conservation Services, Inc-Water Leak Detection

Manhole and Catch Basin Castings
ESS Brothers & Sons Inc.
Ferguson Waterworks

Membranes
Progressive Consulting Engineers, Inc.
Tonka Water
Van Bergen & Markson, Inc.
Vessco, Inc.

Meters/Meter Testing
M.E. Simpson Co., Inc.
Mid America Meter, Inc

Mixing Equipment
Medora Corporation, home of SolarBee and GridBee brands

Odor Control Solutions
Hawkins Water Treatment Group
Medora Corporation, home of SolarBee and GridBee brands
Pollardwater.com

Odor & Corrosion Control
Vessco, Inc.

Operation Services
Bolton & Menk, Inc.
ePortal Software Group
Mid America Meter, Inc
Professional Workforce Training
Stantec Consulting Services

Pipe & Appurtenances
American Cast Iron Pipe Company
HD Supply Waterworks

Pipelines (Steel/Concrete)
AECOM

Process Mechanical
Brown and Caldwell
Van Bergen & Markson, Inc.
WSB & Associates, Inc.

Water Conservation Services, Inc
Water Leak Detection

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Categories (continued)

**Pumps/Pump Systems**

AECOM  
Bergerson Caswell Inc  
E.H. Renner & Sons, Inc.  
General Repair Service  
Hawkins Water Treatment Group  
Minnesota Pump Works  
Northeastern Power Equipment Co.  
Pollardwater.com  
Thein Well Company  
Van Bergen & Markson, Inc.  
W. W. Goetsch Associates, Inc.  
WSB & Associates, Inc.

**Storage Tanks/Reservoir Systems**

Dixon Engineering, Inc.  
Engineering America  
Northeastern Power Equipment Co.  
Pittsburg Tank & Tower Maintenance Co.  
Short Elliot Hendrickson Inc. (SEH)  
Widseth Smith Nolting  
WSB & Associates, Inc.

**Stormwater**

AE2S  
AECOM  
Brown and Caldwell  
ESS Brothers & Sons Inc.  
Ferguson Waterworks  
General Repair Service  
KLJ  
KODRU-MOONEY  
Minnesota Pump Works  
Northwestern Power Equipment Co.  
Prinsco  
Widseth Smith Nolting

**Tanks - Inspection, Painting, Restoration**

Bolton & Menk, Inc.  
KLJ  
Maguire Iron  
Pittsburg Tank & Tower Maintenance Co.  
Short Elliot Hendrickson Inc. (SEH)  
Widseth Smith Nolting

**Tanks/Pre-Stressed Concrete**

Pittsburg Tank & Tower Maintenance Co.

**Valve Assessments/ Hydrant Flow Testing/Smoke Testing**

KODRU-MOONEY  
M.E. Simpson Co., Inc.

**Valves**

American Cast Iron Pipe Company  
Bilfinger Water Technologies-AIRVAC  
HD Supply Waterworks  
KODRU-MOONEY  
Vessco, Inc.  
Wastewater Collection  
Bilfinger Water Technologies-AIRVAC

**Wastewater Conveyance**

Bilfinger Water Technologies-AIRVAC

**Water Quality**

Medora Corporation, home of SolarBee and GridBee brands

**Water Treatment Instrumentation**

AE2S

**Water Treatment Instrumentation**

Northwestern Power Equipment Co.

**Water/Wastewater Treatment Systems**

AE2S  
AECOM  
Black & Veatch  
Bolton & Menk, Inc.  
Brown and Caldwell  
CEI-Carbon Enterprises Inc.  
Kemn Engineering, Inc.  
General Repair Service  
Hawkins Water Treatment Group  
HD Supply Waterworks  
KLJ  
Medora Corporation, home of SolarBee and GridBee brands  
Northwestern Power Equipment Co.  
Progressive Consulting Engineers, Inc.  
Short Elliot Hendrickson Inc. (SEH)  
Tanka Water  
Van Bergen & Markson, Inc.  
Vessco, Inc.  
Widseth Smith Nolting  
WSB & Associates, Inc.

**Water Utilities Products Manufacture**

Hawkins Water Treatment Group  
Northwestern Power Equipment Co.

**Water Wells**

Bergerson Caswell Inc  
E.H. Renner & Sons, Inc.  
Progressive Consulting Engineers, Inc.  
Summit EnviroSolutions, Inc.  
Thein Well Company

**Well Drills**

Bergerson Caswell Inc  
E.H. Renner & Sons, Inc.  
Thein Well Company

**Wellhead Protection**

Summit EnviroSolutions, Inc.

**Well Sitting and Design**

Summit EnviroSolutions, Inc.
Brown and Caldwell

30 7th Street East, Suite 2500
Saint Paul, MN 55101-2201
651-298-0710 F: 651-298-1931
uvempati@brwncald.com
www.brownandcaldwell.com

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CEI-Carbon Enterprises Inc.
28205 Scippo Creek Rd
Circleville, OH 43113
800-344-5770 F: 888-204-9656
sales@ceifiltration.com
www.ceifiltration.com

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5307 S. 92nd Street, Suite 125
Hales Corners, WI 53130
414-529-1859 F: 414-529-3120
joehoban@dixonengineering.net
www.dixonengineering.net

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E.H. Renner & Sons, Inc.
15688 Jarvis Street NW
Elk River, MN 55330
763-427-6100 F: 763-427-0533
trenner@ehrrenner.com
www.ehrrenner.com

Engineering America
647 Hale Ave N
Oakdale, MN 55128
651-777-4014 F: 651-777-5312
khrize@ferguson.com
www.engamerica.com

eRPortal Software Group
59 Interstate Drive
West Springfield, MA 01089
413-233-5400 F: 413-739-0299
sales@erportalsoftware.com
www.erportalsoftware.com

ESS Brothers & Sons Inc.
9350 County Rd 19
Loretto, MN 55340
763-478-2027 F: 763-478-8868
trent@essbrothers.com
www.essbrothers.com

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Ferguson Waterworks
1604 91st Avenue NE
Blaine, MN 55449
763-560-5200 F: 763-560-1799
karen.olson@ferguson.com
www.ferguson.com

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General Repair Service
3535 International Drive
Vienna Heights, MN 55110
651-766-0874 F: 651-766-0875
raya@generalrepair.com
www.generalrepair.com

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Hawkins Water Treatment Group
2381 Rosegate
Roseville, MN 55113
612-331-0910 F: 612-331-5304
customer.service@hawkinsinc.com
www.hawkinsinc.com

HD Supply Waterworks
Hdsupply.com

HR Green, Inc.
2550 University Avenue West, Suite 400N
St. Paul, MN 55114
651-644-4389 F: 651-644-9446
assumption@hrgreen.com
www.hrgreen.com

HydroCorp
266G S. Moorland Rd., Ste. #209
New Berlin, WI 53151
800-315-4305
info@hydrocorpinc.com
hydrocorpinc.com

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PO Box 1028
Forest Lake, MN 55025
651-765-0765 F: 651-407-0609
Theresa.ryan@interstatepm.com
www.interstatepm.com

K

KLJ
1505 S 30th Ave
Moorhead, MN 56560
218-287-0300 F: 855-288-8055
www.kleng.com

KODRU-MOONEY
KODRU MOONEY
3650 N. Chestnut St
Chaska, MN 55318
952-479-1045 F: 952-843-5603
matthew@kodru-equipment.com
www.kodru-equipment.com

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St. Paul, MN 55112
651-490-1405 F: 651-490-1099
dave.hume@lbgmn.com
www.lbgweb.com

M

M.E. Simpson Co., Inc.
3406 Enterprise Ave.
Valparaiso, IN 46383
800-255-1521 F: 888-531-2444
salesinfo@mesimpson.com
www.mesimpson.com

Maguire Iron
Box 1446
Sioux Falls, SD 57115
605-334-9749 F: 605-334-9752
info@maguireiron.com
www.maguireiron.com

Medora Corporation,
home of SolarBee and GridBee brands
3225 Highway 22
Dickinson, ND 58601
866-437-8076 F: 765-560-0333
pce@pce.com
www.pce.com

Mid America Meter, Inc

Minneapolis Pump Works
1 Cannon Street W
Dundas, MN 55019
657-645-8045 F: 657-645-7533
info@minneapolispumpworks.com
www.minneapolispumpworks.com

Moore Engineering, Inc.
1808 E. Fir Avenue
Fergus Falls, MN 56537
216-998-4041 F: 216-998-4042
hvnell@mooreengineeringinc.com
www.moorengineeringinc.com

N

Northwestern Power Equipment Co.
2740 Patton Rd
Roseville, MN 55113
651-628-0633 F: 651-628-0753
rshannon@nwpeco.com
www.nwpeco.com

P

Pittsburg Tank & Tower Maintenance Co.
PO Box 913
Henderson, KY 42419
270-826-3000 F: 270-831-7025
vauditt@ptttmco.com
www.wastetank.com

Pollardwater.com
17515 NE 67th CT
Redmond, WA 98052
800-437-1146 F: 425-861-7235
info@pollardwater.com
www.pollardwater.com

Prinsco
1717 16th Street NE
Willmar, MN 56201
800-992-1725 F: 320-222-6820
Prinscoinfo@prinsco.com
www.prinsco.com

Professional Workforce Training
1355 West Highway 10
Anoka, MN 55303
763-576-4108 F: 763-433-1201
nltutsav@anokatech.com
www.workforce-training.com

Progressive Consulting Engineers, Inc.
6120 Earle Brown Drive, Suite 629
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2335 Highway 36 West
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info@stantec.com
www.stantec.com

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1217 Bandana Boulevard North
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www.summite.com

Thein Well Company
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theinwell@tds.net
www.theinwell.com

Titan Energy Systems Inc.
6321 Bury Drive, Suite 8
Eden Prairie, MN 55346
952-900-2371 F: 952-938-3290
www.titaneenergy.com

TKOA
444 Cedar Street, Suite 1500
Saint Paul, MN 55101
651-292-4400 F: 651-292-0083
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www.tkoa.com

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**Industry News**

**Gina McCarthy speaks on importance of clean and safe water**

Gina McCarthy, head of the U. S. Environmental Protection Agency, spoke at a press conference at St. Paul Regional Water Services on April 8 on the importance of clean and safe water. With St. Paul mayor Chris Coleman on her right, McCarthy noted that St. Paul and Minneapolis recognize not only the public-health value related to safe drinking water but also the importance of safe water for economic vitality. “These two cities rock,” she proclaimed to the applause of the audience. McCarthy’s St. Paul stop was part of a Midwest tour to focus on the need to protect water sources, particularly rivers and streams that are vulnerable to pollution. She also received a tour of the St. Paul treatment plant (with Minnesota Department of Health commissioner Ed Ehlinger to her right).

**Bemidji State offers non-disposable water bottles at no charge and has bottle-filling stations in its buildings**

Two members of the student senate had proposed the action to foster environmental sustainability and to promote access to free water. A former senate member objected to the action on the grounds it would “infringe on personal liberty by imposing the senators’ environmental beliefs on others.”
Minneapolis Water Works Honored

Minneapolis Water Works received the Sustainable Water Utility Management Award from the Association of Metropolitan Water Agencies. Only nine public drinking water systems nationally received the award, which recognizes water utilities that have made a commitment to management that achieves a balance of innovative and successful efforts in economic, social, and environmental efforts.

Minneapolis has incorporated strategies and financial procedures that include requiring the water division to maintain a minimum cash balance equal to approximately three months of operating expenses to keep cash flow available. It also implemented a five-year capital improvement program that documents each construction project, its estimated cost, and the source of funding as well as the use of a fixed rate in utility billing, which helps stabilize revenues from fluctuations in water use due to weather conditions and the declining water demand by customers. Minneapolis has encouraged its customers to use water wisely and has been engaged in other environmental stewardship initiatives, including sustainable design in capital projects, efficient vehicles, collaboration on source water protection, support of urban farms and community gardens, promotion of the value of drinking water, and reduction of the use of disposable water bottles.

The Association of Metropolitan Water Agencies—an organization of the largest publicly owned water utilities in the country—has recognized Minneapolis twice before, in 2002 with the Gold Award for Exceptional Utility Performance and in 2011 with the Platinum Award for Utility Excellence.

History of On-Site Sodium Hypochlorite Generation


“On-site generation of hypochlorite in the United States was largely inspired by the use of hypochlorite solution during World War I . . . . Its success as an antiseptic for treatment of open wounds led to on-site generation of it in hospitals. . . . Wallace & Tiernan (now part of Evoqua Water Technologies) first made electrolytic chlorinators to provide a safe means of chlorinating swimming pools in buildings where people slept. . . . The chlorinator aroused the interest of Pan American Airways, which, at the time (1938), was establishing refueling sites on its San Francisco-to-Sydney and Orient flights.

“After World War II, the enthusiasm for on-site generation of chlorine disappeared until the hazard potential of chlorine gas stored in containers was evaluated, owing to the proliferation of chlorine gas installations at wastewater and potable water treatment plants. . . . In the 1970s the popularity of on-site generation began to rise once again, largely because of the potential hazards of liquid-gas systems using chlorine stored in containers. . . . Starting in the 1990s, after the advent of the Uniform Fire Code, there has been a great surge in the interest of on-site generation of chlorine. The product is inherently safer because of its lower concentration. . . . Current on-site generation systems produce chlorine solutions containing only 0.8% chlorine, and this concentration is not classified as hazardous.”

Briggeman said more interest in the system was sparked by the terrorist attacks on September 11, 2001. “After the attacks, the risk associated with chlorine gas systems was reevaluated. In addition, with a culture more attuned to risk and safety of operators and surrounding communities, interest in and installation of on-site generation sodium hypochlorite units have seen a significant increase.”

Portland Rebounds

The water utility in Portland, Oregon, has been in the news in recent years, but not for the most savory of reasons. Twice the utility has had to drain a reservoir after someone had been seen However, the city has rebounded with headlines focusing on how it is generating electricity from turbines installed in its water pipes. Portland has replaced a section of its water distribution system with pipes containing 42-inch turbines with power-attached generators. The energy produced is fed back to the city’s electrical grip. The turbines and generators are installed in pipes in which the water doesn’t have to be pumped (pipes where the water flows downhill, for example). Eventually the system may generate more than 2 million dollars’ worth of renewable energy capacity over 20 years, projected as enough electricity to power to 150 homes.

More information, including a video, is available at http://tinyurl.com/kynz4wk.
AMERICAN Amarillo Fast-Grip Gaskets

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News & Notes

2015 Drinking Water Institute to be Held in Minneapolis

Water Works! A Drinking Water Institute for Educators will be held at the Minneapolis Water Works ultrafiltration treatment plant this summer from Monday, August 3 to Wednesday, August 5. Each year Minnesota science teachers attend the three-day Institute, learning about drinking water and ways to develop inquiry-based activities that can be incorporated into their existing science curriculum. The program is free to interested teachers, who will receive college credit for their participation.

Water Works! is sponsored by the Minnesota Department of Health and the Minnesota Section of AWWA and is conducted through a partnership with Hamline University’s Center for Global Environmental Education. More information is available on the MDH website at www.health.mn.gov/water/institute/index.htm.

Former Water Operators Mike Albrecht and Gerry “Boot” Butenhoff Die

Mike Albrecht, who retired as superintendent of the water system in LaCrescent about a year ago, died last September 24. Albrecht had worked for the city’s maintenance department for 40 years. He retired as maintenance supervisor in 2013. The city has renamed its radium treatment plant, built in 2008, the Mike Albrecht Memorial Building.

Another recently retired operator, Gerry “Boot” Butenhoff of Red Wing, died March 26. Butenhoff had retired on November 1, 2014 after 37 years in the city’s utilities department. “He was a true lone wolf, going about life his own way but was always there when needed,” read his obituary.

Hydro-Klean Acquires Infratech

DES MOINES, IOWA, April 20 – Hydro-Klean announced today that it has acquired Infratech. This acquisition allows Hydro-Klean to offer additional specialized trenchless rehabilitation services to municipal clients throughout the Midwest.

Infratech has built a reputation over 20 years for its superior collection system inspection and restoration services. Additional services include pipeline cleaning and inspection, sealing and structural point repair systems, manhole sealing and rehabilitation, structural, restoration and protective coatings. Infratech’s extensive line of services, products and equipment complement Hydro-Klean’s wide range of municipal and industrial services.

“Infratech has developed a strong reputation for their trenchless rehabilitation services,” said Paul Govoni, vice president of Hydro-Klean. “We strive to provide effective, efficient and safe services to our clients. We know that by bringing together the Infratech team with Hydro-Klean, we will be able to provide even more to customers.”

The Infratech facility will remain in Rogers, Minn. For more information, please visit Hydro-Klean’s website. Hydro-Klean provides an array of services to industrial and municipal clients throughout the Midwest. It’s headquartered in Des Moines, Iowa, with locations also in North Mankato, Minn., Sioux Falls, S.D. and Watertown, S.D.

Now Seeking Nominations for Volunteer of the Year and Operators’ Meritorious Service Awards

MN AWWA is currently seeking nominations for two of our most prestigious awards: Operators’ Meritorious Service and Volunteer of the Year. This is your opportunity to help recognize the outstanding efforts of colleagues and peers in the Minnesota Section AWWA. For more information about the awards to download a nomination forms, go to https://mnawwa.site-ym.com/?AwardApplications.
Trisha Sisto joins Drinking Water Protection Section of MDH

Trisha Sisto has joined the Drinking Water Protection Section of the Minnesota Department of Health as a public health sanitarian working on the groundwater monitoring virus study.

A native of Clinton Township in Michigan, Trisha has worked in biomedical, water, and tick research and most recently at a veterinary clinic. She is familiar with animals as she and her husband, Michael, have a dog, Tucker, and cats Cooper and Bonzai, in addition to Scarlett, a service dog in training who will be placed in a K9 service-dog program for veterans with post-traumatic stress disorders.

As for hobbies, Trisha loves to travel, enjoys outdoor sports, and is training for her first triathlon. She also likes reading and trying new types of yoga.

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AWWA India

What an exciting time for AWWA and its members!!! We are on our way to becoming a premier non-profit global organization focusing on total water solutions. AWWA is going to establish its first international community (outside of North America) in India. In an effort to achieve Association’s vision of a “better world through better water,” the International Council of AWWA has analyzed the publication sales and membership and registration metrics of our international members/customers. It is also evaluated demographically along with environmental and political aspects of the countries with which AWWA would make a difference. After this analysis, India emerged as the top country to investigate an in-country presence.

The primary purpose of AWWA India is to serve the needs of the Indian AWWA members and act as a resource for helping the Indian water professionals improve water and wastewater supply and distribution, build a community to support educational needs, and advance a sustainable future in India.

As a part of the AWWA India initiative, David LaFrance (AWWA Chief Executive Officer), John Donohue (AWWA President), and Nilaksh Kothari (AWWA Past President) represented AWWA at the Indian Water Works Association (IWWA) Conference, which was held from January 30-February 1, 2015 in Kolkata, India. As I mentioned in the Fall 2014 Breeze, my family and I planned our India vacation around the same time, which gave me an opportunity to join the AWWA delegation at the IWWA Conference. In addition to delivering technical presentations at the conference, we met with various groups and government entities in India over the two week period of time. With an eye toward AWWA India’s training mission, LaFrance, Donohue, and Kothari have hosted three half-day seminars in New Delhi, Bangalore, and Mumbai that touched on important water issues such as asset management, leak detection, and rate issues. During this time, I was able to conduct two workshops for the Hyderabad Water Sanitation Board on the water treatment plant optimization.

Since we came back from our successful India trip, the AWWA India membership increased from 25 to 100 members. At this rate, we are anticipating that the membership will reach 250 members by the end of this year. An AWWA India delegation containing 25-40 members is planning on coming to ACE 2015 conference in Anaheim.

During our India trip, some of the water treatment utilities in India have expressed interest in receiving operator training from AWWA. AWWA is anticipating similar requests from some more utilities in the near future. To address these requests and modify the existing AWWA training modules to more India-centric training modules, President John Donohue has formed a North American Advisory Group. This group will act as the bridge between AWWA and AWWA India volunteer leaders for delivering the training modules to the water utilities in India. I felt honored and privileged when President Donohue asked me to chair this group. I am very happy to be a part of this historic initiative of AWWA.

AWWA anticipates introducing AWWA India’s first executive manager in the coming months. In addition to opening an office, the executive manager’s initial focus will be on building a community of water professionals who collaborate to support public health, environmental protection, and best management practices. AWWA India will also develop training for engineers and utility managers.

The AWWA India initiative will serve as the model for AWWA to grow its presence and be the premier non-profit global organization for total water solutions. I will keep you posted on AWWA India updates in the future. Until next time...
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