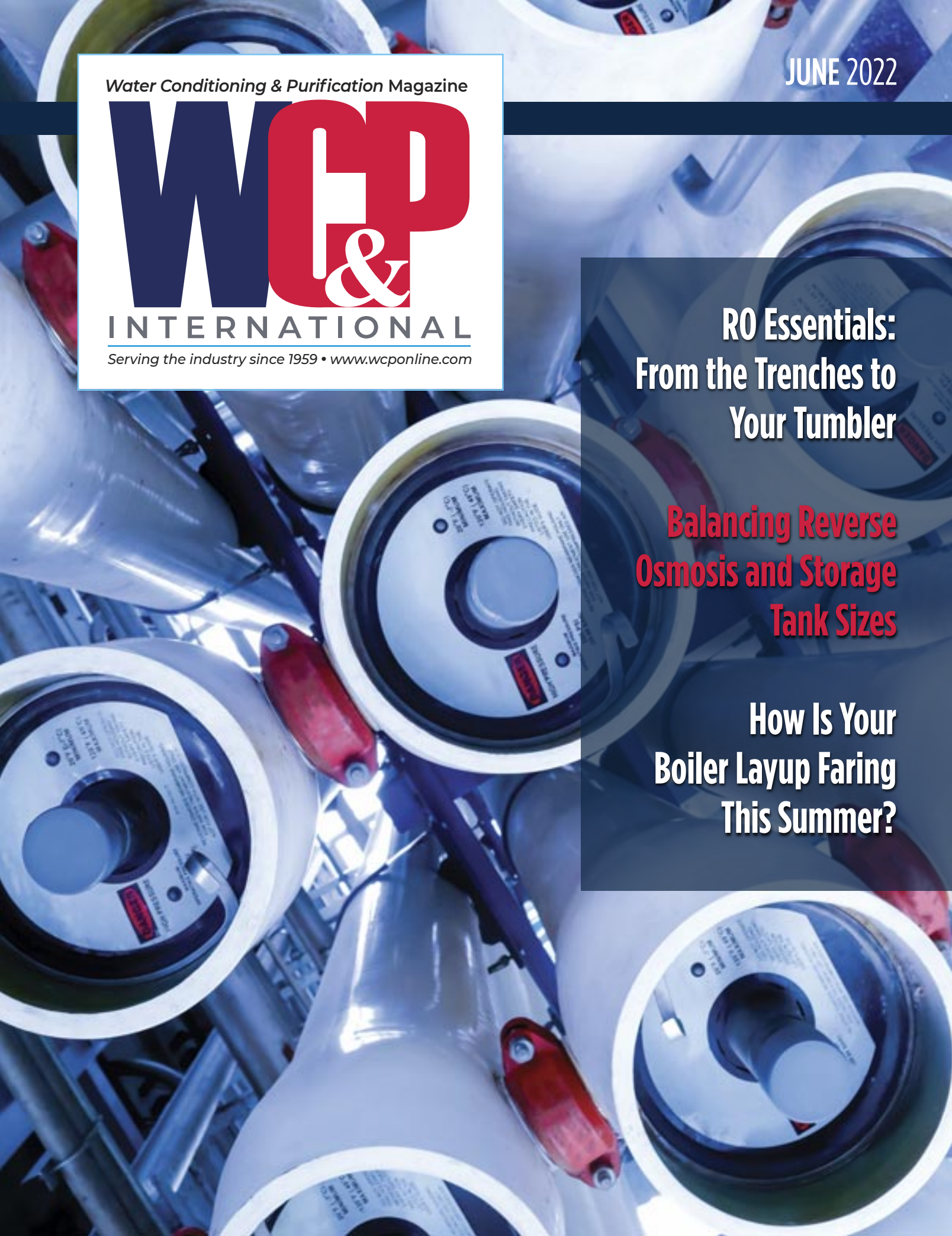




Water Conditioning & Purification Magazine

WCP
&

INTERNATIONAL

Serving the industry since 1959 • www.wcponline.com

JUNE 2022

**RO Essentials:
From the Trenches to
Your Tumbler**

**Balancing Reverse
Osmosis and Storage
Tank Sizes**

**How Is Your
Boiler Layup Faring
This Summer?**



**BE IN BUSINESS FOR
YOURSELF, NOT BY YOURSELF.**

Because we operate multiple dealerships ourselves, we work in the same business you do everyday. We understand what you are going through. And, with all this experience, we have developed a proven marketing system made for today's consumers that will help you sell more.

In fact, dealers that have joined the Aqua Systems team in the last three years have increased their business by **at least 20%**.

Curious? Visit AquaDealers.com to learn more.

Aqua Systems is also the proud owner of the Hellenbrand family of quality water treatment products.



THE SIGNS ARE EVERYWHERE...
**IT'S TIME TO SWITCH TO
HYDRONIX!**



✓ PRICE ✓ PERFORMANCE ✓ PROFITABILITY ✓ RELIABILITY



HF45 SERIES
4.5" Commercial Filter Housing



HF5 SERIES
Commercial Filter Housing



AQUATROL
Pressure Tanks



AQUATROL
Control Valves



SBC SERIES
Sediment Bonded Depth Cartridges



SWC SERIES
String Wound Cartridges



SDC SERIES
Sediment Depth Cartridges



CB SERIES
Carbon Block Filters



SPC SERIES
Polyester Pleated Cartridges



CIC SERIES
Carbon Impregnated Fiber Cartridges

HYDRONIX™
WATER TECHNOLOGY



Hydronix ... The H in your H₂O

www.hydronixwater.com

THE HIGHEST-QUALITY PRODUCTS MADE IN THE USA

MANUFACTURING AND DISTRIBUTION HEADQUARTERS
WISCONSIN

DISTRIBUTION CENTER
ARIZONA

MANUFACTURING
ARKANSAS

DISTRIBUTION CENTER
FLORIDA

Serving the water treatment professional for over 75 years, Clack Corporation has grown to become one of the world's leading manufacturers and distributors of water treatment components for residential, commercial and industrial applications. Headquartered in Windsor, Wisconsin with additional facilities in Rogers, Arkansas, Phoenix, Arizona and Jacksonville, Florida; Clack serves customers in the United States and throughout the world.



Control Valves,
Fittings
and Accessories *



Clack Manufactured
Mineral, Specialty
and Retention Tanks



Brine Tanks,
Cabinets and
Components



Clack
Filter
Media

PLEASE VISIT OUR WEBSITE AT CLACKCORP.COM AND VIEW OUR CAPABILITIES VIDEO



Wisconsin Distribution Center



A FAMILY COMPANY FOR OVER 75 YEARS

4462 DURAFORM LANE, WINDSOR, WI 53598 • 608-846-3010

Your strategic partner in a changing environment.

* All Clack Control Valves are designed, assembled, air tested and water tested in Wisconsin, USA. The majority of control valve components are manufactured in the USA with some sourced worldwide.

MUR-LOK®

Connect with Confidence



ENGINEERED TO PREVENT LEAKS



DURABLE MATERIALS



EASY TO INSTALL



Made in USA

MANUFACTURED BY:



G.A. Murdock, Inc.

Wholesale Water Conditioning Supplies

800-568-7565 • 605-256-9632

South Dakota • Florida **NEW**

Register online to order factory-direct at wholesale prices
www.gamurdock.com/wcp



CONTENTS

Features

- 20** RO Essentials: From the Trenches to Your Tumbler
by Stephen Hamilton
- 24** Balancing Reverse Osmosis and Storage Tank Sizes
by Larry Zinser
- 28** How Is Your Boiler Layup Faring This Summer?
by Scott Bryan and Julie Holmquist

Columns

- 12** Modern Marketing: 5 Ways to Use Email Marketing to Grow Your Water Treatment Business
by Amanda Crangle
- 32** Water Matters: Formalizing the Approach to Testing Scaled-Down POE Systems for Contaminant Reduction
by Rick Andrew
- 34** Dealer Profile: Fixing What Water Broke
by Emma H. Peterson
- 38** On Tap: The Important Role of Virus Mitigation in Water Reuse
by Brooke K. Mayer, PhD, PE

Departments

- | | | | |
|-----------|------------------|-----------|--------------------------|
| 8 | Viewpoint | 42 | What's New |
| 10 | Global Spotlight | 44 | Marketing Showcase |
| 16 | People | 46 | Classifieds |
| 18 | Upcoming Events | 48 | Directory of Advertisers |

**The Voice of
Professional
Excellence**
in POU/POE
Water Treatment
Since 1959

UPCOMING ISSUES

July
Ozone / Pools & Spas

August
International / Sanitation

September
Coolers / Water Vending /
Bottled Water

ON THE COVER



Cover photo source:
Shutterstock

WC&P serves water treatment dealers, manufacturers, wholesalers and suppliers. Contact info@wcponline.com or visit www.wcponline.com/subscribe to subscribe. Copyright 2022. Printed in the USA. Volume 64, Number 06.

Water Conditioning & Purification International (ISSN 1537-1786) is published Monthly except an extra issue in June by Meliora Group LLC, 5852 Colfax Ave., Alexandria, VA 22311-1014. Periodicals postage paid at Alexandria, VA, and additional mailing offices. POSTMASTER: Send address changes to Water Conditioning & Purification International, 6021 Leesburg Pike #1100, Falls Church, VA, 22041-9998.



SKIP THE EXCUSES OF NO INVENTORY. WE ARE
**STOCKED &
READY TO SHIP**

DON'T BELIEVE US?
Give us a call and we will show you.
608-524-9465

- Inventory on hand
- Master Distributors across North America
- Ships as soon as you order
- Real live customer service

Let us fix your loss of sales by **filling your inventory.**

REVV4
CERTIFIED SOFTENING SYSTEMS



- Patented Ceramic Discs
- 72 Hour Memory Backup
- Upflow/Downflow versions
- 7 Advanced Programming Options



HANKSCRAFT RUNXIN
PROUDLY LOCATED IN REEDSBURG, WISCONSIN • USA
608.524.9465 | WWW.HRH20.COM | SALES@HRH20.COM



VISIT US ONLINE BY SCANNING
THE QR CODE WITH YOUR PHONE



RELATIONSHIPS **FORGED** BY WATER

You can depend on Nelsen for custom water solutions, exceptional service and a family-focused partnership.

Jeff Gassaway, Senior Inside Sales Representative - *Nelsen Corporation*

Matthew Glass, President *Glass Water Systems, Inc.*

NELSEN
CORPORATION

SOLUTIONS BUILT FOR YOUR BUSINESS

TRUST NELSEN TO BUILD YOUR SYSTEM

We are problem-solvers. The leader in water treatment OEMs, Nelsen Corporation's focused approach revolves around the unique needs of each customer, servicing professional dealers at the speed your business demands. Our exceptional team will work tirelessly to customize your equipment to your exact specifications, building solutions for your business that tackle multiple water issues simultaneously.



Research, innovate, perfect, repeat.

For 20 years Omnipure carbon blocks have been the benchmark of American carbon block production. Our manufacturing process delivers high quality carbon blocks with increased capacity, lower carbon fines, and targeted reduction for versatility in the field. Available in 10, 5, or 1 micron, Omnipure carbon blocks are the perfect addition to existing systems or as their own stand-alone solution.

- American made carbon blocks since 1999
- Industry leader in carbon block technology
- Trusted worldwide
- Built to quality, priced for value, always with service



100% MANUFACTURED
IN THE USA

RESIDENTIAL &
COMMERCIAL

THIRD-PARTY CERTIFIED
AND TESTED



800-362-8696

»»» OHIO | ARIZONA | FLORIDA | TEXAS »»»

NELSENCORP.COM

omnipure.com | 800-398-0833 | sales@omnipure.com

Don't Try to Solve Complex Problems

I came across the phrase “manage, not solve” in a business article. The idea was that complex problems cannot be solved once and for all, but that those problems can be managed in the moment. It’s easy to see how this applies to many areas of business. You cannot fix a shortage of workers with one strategy that will always work. But you can manage a labor shortage by mixing and matching tactics, benefits, methods, and timing to alleviate the problem now. But that exact combination will not work when there is another labor shortage in the future because the circumstances, technology, needs, and possibilities will be different.

This is easy to see in water treatment as well. It’s convenient to think that one water treatment method will always be the right choice for a certain contaminant or situation. Yet, technology will advance, groundwater will change, regulations will be updated, budgets will shift, and that fantastic solution is no longer the answer.

One of the goals here at WC&P is to deliver accurate and up-to-date information for the water treatment industry so that you can manage, not solve, the challenges that you face every day. Even the most popular methods and reliable products in water treatment need to be revisited over time. In this issue, we dig into reverse osmosis (RO) water treatment and water recovery and reuse.

Stephen Hamilton of Franklin Water Treatment explains the essentials of an RO system. The variety of stages, passes, features, and materials will cause swings in RO performance, pricing, and waste. In commercial and industrial applications, RO is a popular water treatment method. Larry Zinser of Master Water breaks down how to determine the best combination of RO and storage tank.

Brooke K. Mayer, PhD, PE, explains the need for water reuse, but adds that regardless of the end use of the reclaimed water, reliable pathogen removal is the most critical part of treatment.

Scott Bryan and Julie Holmquist of Cortec Corp. examine vapor corrosion inhibitor technologies as a beneficial option for preventing corrosion in seasonally used boilers.

While there are more third-party certifications of POU systems, Rick Andrew discusses why and how the evaluation and certification of POE systems is also important. Amanda Crangle shares how to be successful with email marketing. In the Dealer Profile, Operations Manager James Mullis shows why excellent problem-solving and customer service helped Benjamin Franklin Plumbing to be a leader in Florida.

As always, I love to hear your thoughts and reactions. I hope to see you in-person at a conference soon.



Deborah Stadtler

Deborah Stadtler, Publisher

MEET UP WITH WC&P STAFF

- June 15-17 — Florida WQA Annual Convention
Daytona, FL, USA <https://fwqa.com/>
- July 25-28 — 49th Annual TWQA Convention & Exposition
Frisco, TX, USA <https://twqa.org/events.php>
- September 21-23, 2022 — Eastern WQA Fall Trade Show and Conference
Wilkes-Barre, PA, USA www.ewqa.org



Water Conditioning & Purification Magazine
INTERNATIONAL
Serving the industry since 1959 • www.wcponline.com

- Founders —
Jerome R. Peterson
Sharon M. Peterson
- Publisher —
Deborah Stadtler
dstadtler@wcponline.com
- Associate Editor —
Kaitlyn Longstaff
klongstaff@wcponline.com
- Advertising —
For inquiries contact
advertising@wcponline.com
- Classifieds / Online Ads —
For inquiries contact
ads@wcponline.com
- Graphics Manager —
Shawn Thompson
sthompson@squawdesign.com

- WC&P TECHNICAL REVIEW COMMITTEE**
Gary Battenberg
Argonide Corporation
Peter S. Cartwright, PE, MWS
Cartwright Consulting Co.
Greg Reyneke, MWS
Red Fox Advisors
Matthew Wirth, MWC
Pargreen Water Technologies
Lawrence R. 'Larry' Zinser
Master Water Conditioning

Meliora Group, LLC
6021 Leesburg Pike, #1100
Falls Church, VA 22041-9998
info@wcponline.com
www.wcponline.com

- Follow us on LinkedIn
<http://bit.ly/WCPLI>
- Follow us on Twitter
[@WCPOnline](https://twitter.com/WCPOnline)



GLOBAL LEADER IN
**WATER TREATMENT
& REVERSE OSMOSIS**



Sea Water
Reverse Osmosis



Brackish Water
Reverse Osmosis



Industrial
Ultrafiltration



Industrial
Water Filtration

“Worldwide Experience with Superior Technology”

Pure Aqua, Inc. is a global leader in manufacturing and distribution of industrial water treatment equipment and membrane systems. We offer a wide range of pre-engineered as well as custom engineered solutions for all types of water purification needs.

Water Treatment and Membrane Systems offered by Pure Aqua, Inc.:
Brackish Water Reverse Osmosis, Sea Water Reverse Osmosis, Double Pass Reverse Osmosis, Ultrafiltration Systems, Containerized Reverse Osmosis Systems, Automatic Multi Media Filters, Automatic Carbon Filters, Cartridge Filters, Automatic Water Softeners, Electrodeionization (EDI), Two Column or Mixed Bed Deionizers, Ultra Violet Sterilizers (UV), Chemical Dosing Systems, Pre / Post Chlorination Systems and Custom Built Water Treatment Systems.

We also stock and sell a large variety of Water Treatment Components such as Membranes, Pressure Vessels, Softener / Filter Valves, Chemical Pumps, Filter Media, etc.

For more information on any of Pure Aqua, Inc. products please go to www.pureaqua.com
También visite nuestra página web española www.pureaqua.es

www.pureaqua.com • +1 (714) 432-9996 • sales@pureaqua.com

Global Spotlight

NORTH AMERICA

A Reliable Water Supply and Addressing Contamination Are Top Priorities

Ensuring a reliable water supply and addressing drinking water contamination continue to rank among voters' top priorities for the federal government, according to the 2022 Value of Water Campaign. As in past years, voters feel very positively about their local infrastructure, their drinking water safety, and the safety of their water pipes. However, as in the past, they are split on their view of the quality of national water infrastructure—and have grown less positive over time. Voters are broadly supportive of the federal investments in water infrastructure made by the bipartisan infrastructure bill.

The Value of Water Campaign annually polls American voters to better understand their opinions on the state of the nation's water infrastructure and what they view as priorities for action and potential solution.

Supercritical Water Oxidation Used to Destroy PFAS

It is estimated that more than 200 million Americans in all 50 states could have PFAS in their drinking water. PFAS have been virtually indestructible but new technology aims to change that. According to Amy Dindal, PFAS program manager for scientific nonprofit Battelle, a process called supercritical water oxidation will break down the chemical bonds in just seconds.

"Supercritical water' means that you increase the temperature and increase the pressure and you get it into a special state, where the oxidation will occur more naturally. So in this special state, it breaks the [carbon-fluorine] bond," Dindal said.

The Water Tower Celebrates Grand Opening on Earth Day

Earth Day, April 27, 2022, saw the grand opening of The Water Tower. The Water Tower is a water industry innovation center located in Gwinnett County, GA, that will serve as a hub for water utilities, researchers,

companies, and ground-breaking advancements in solving critical water and environmental challenges.

The Water Tower initiative was launched in 2019 with the creation of two nonprofit organizations, The Water Tower at Gwinnett and The Water Tower Institute.

National Pool Partners Becomes Largest Pool Service Company in Arizona

National Pool Partners (NPP) has acquired X-Pools of Scottsdale, AZ, and Tropical Waters Pools of Gilbert, AZ, establishing them as the largest residential pool service company in the state. X-Pools and Tropical Water Pools will integrate into NPP's established Aquaman Pools brand. NPP, with these acquisitions, now surpasses 5,500 pool stops in Arizona and continues its rapid and strategic growth across the nation's largest residential pool markets.

Aqua-Leisure Recreation Acquires INYO Pool Products

Aqua-Leisure Recreation, LLC, a market

leader in the aquatics consumer product industry, has announced its acquisition of INYO Pool Products, LLC. INYO Pool, based in Longwood, FL, is the leading direct-to-consumer brand of swimming pool supply, repair, and maintenance products.

EUROPE

Denmark and the US Join Forces in the Water Sector's Race to Zero

In an effort to pave the way for Net Zero emissions and a resilient water sector, the US Water Alliance; the Embassy of Denmark in Washington, DC; and the Danish Water and Watershed Association signed a new Memorandum of Understanding on April 27, 2022. This new agreement supports transatlantic efforts to lower climate impacts in the water sector while underscoring the importance of international partnerships and knowledge-sharing to advance a climate secure future.

ASIA

New Joint IWA-SWA Singapore Young Water Professionals Chapter

The International Water Association (IWA) and the Singapore Water Association (SWA) have established a joint IWA-SWA Singapore Young Water Professionals Chapter. This chapter will offer opportunities for young water professionals based out of Singapore. Through a Memorandum of Understanding signed in April 2022, the two organizations are looking to connect their respective networks and are eager to identify joint actions to enable water management.

MIDDLE EAST

Advanced Watertek installs RO plant in isolated village

Advanced Watertek, a membrane-based water treatment company, had to overcome logistical challenges to install a reverse osmosis plant in Kumzar, Oman, a village

that is only accessible by boat. The village previously relied on desalination for their drinking water supply from a plant that is over a decade old.

Keeping size restrictions in mind for transportation, loading, and unloading without any lifting equipment, components were dismantled for easy handling and transportation and then re-assembled on-site. The dismantled parts were transported using locally available boats.

The capacity of the old RO plant was 100m³ per day, while the new RO plant was designed with a system capacity of 300m³ per day. Advanced Watertek included an energy recovery device in the design in order to recover wasted high-pressure brine energy; this reduced the high-pressure pump and motor size and lowered energy consumption. **WCP**

♦ To submit your announcement, please send the information to WC&P at info@wcponline.com.

Join the residential, commercial and industrial water treatment community and receive exclusive member benefits.

Join now at wqa.org/membership.



EVENTS **EDUCATION**
INDUSTRY NEWS **GOVERNMENT AFFAIRS**
LEAD GENERATION
INFORMATION ACCESS

It's Not Just About Hard Water Anymore.

Get the skills you need with WQA's Professional Certification & Education programs

INSTRUCTOR-LED CLASSES START JUNE 23, 2022.

CORROSION
PFAS **1,2,3-TCP**
NITRATES
TREATMENT **LEAD**
ARSENIC **RESEARCH**



wqa.org/profcert

5 Ways to Use Email Marketing to Grow Your Water Treatment Business

Think about the last thing you purchased that was of higher value than a simple consumable. Do you remember why you chose that product, brand, feature, or benefit? Do you recall how often you saw ads or were contacted by the company selling the item you purchased?

Odds are, you likely don't remember all the touchpoints. However, you likely remember that there was messaging consistency leading up to your decision to purchase.

According to recent data, response rates rise with each outreach or "touchpoint" until you hit eight. From there, further touchpoints see a diminishing rate of return.¹ Touchpoints can include phone calls, text messages, emails, direct mail pieces, remarketing using social media or display advertising, or an in-person visit when appropriate.

This begs the question: How consistently are you touching base with your prospects and customers to further the relationship, provide added value to their lives, and grow your company?

Let's discuss five ways we can use email marketing as an effective communication source, inspiring those we can help to act now. Email marketing is still one of the most potent forms of advertising. However, it must be implemented in the right way.

What is the right way? Glad you asked!

Each step in your marketing process requires a different message and call-to-action to nurture your prospects. Asking people to buy right when they first hear about you is like asking a person you've never met to marry you. Identifying your prospects' needs and guiding them along with value is a sure-fire way to build trust and get them to say, "I do."

1. Website Visitor Opt-In

Just because someone visits your website doesn't mean they're ready to contact you. An opt-in can capture the person who hangs in the balance between not yet interested and ready to buy. They need more information without the pressure of human interaction, and they want to do their research and consume whatever information you feed them.

Creating an opt-in on your site can help cut through the clutter of misinformation on the web and clearly explain your process for providing them precisely what they need when they need it.

Whether you're a water treatment dealer, a supplier, an OEM, or a consultant, you can use this opt-in to "drip" relevant information to your subscribers. This can help educate them on your value proposition and any relevant water quality issues, unique product differentiators, or industry information.

The beauty of email opt-ins is that you can then upload your email subscriber list to Facebook, Instagram, YouTube, Google, and other online platforms so you can "remarket" to them. Retargeting allows you to have omnipresence and provide consistent branding and value while also asking them to take the next step with your company.

2. New Web Form Leads

When someone submits a form on your website to learn more about you, your products, or your services, this is considered a "lead."

Putting yourself in your prospective customer's shoes can help you identify ways to use email to provide valuable information that inspires them to call you or book an appointment.

Email marketing platforms like MailChimp, ActiveCampaign, or HubSpot allow you to segment your campaigns to fit the type of audience to which you're speaking. For example, if you have an option on your website form for a person to select if they are an existing or past customer, you can send them a different email series. If they do not choose that option, you'll know with relative certainty that they are a new prospect and can benefit from an email nurture sequence.

I suggest you use email marketing at this level to provide educational information with a solid call to action. Using promotional discounts and loud emails with fake scarcity may work in the short haul but can devalue your brand and cause distrust in the long run. That being said, there is a time and place for promotions as long as they are sincere and communicated in a way that adds value instead of decreasing value.

3. Sales Appointment Booked

What better way to differentiate yourself from your competitors than by sending a short series of automated emails to your prospective customer with information and videos letting them know exactly what to expect during their appointment?

Adding a video from the salesperson they'll meet that covers FAQs and any relevant educational information will be appreciated by the prospect. Especially if you'll be entering someone's home to test their water, helping them get to know you through video can go a long way to building trust long before you set foot in their house.

Very few businesses use email in this way to build trust. In doing so, you'll be setting yourself apart from the other companies they're evaluating while creating an exceptional customer experience that will build long-term brand equity.

4. Unresponsive Leads

"Do you hate me?"

I've actually received emails with this subject line or something similar that guilted me into opening the email and responding to the person on the other side of the ether. This last-ditch effort may result in clicks; however, like spammy promotions, consider the long-term effect on your brand's reputation.

Every company that relies on leads for growth has experienced being ghosted by a formerly hot-to-trot prospect. Automated email campaigns can help you understand why people are not moving forward so that you can continue optimizing your marketing efforts for those who are more serious and improve your marketing process to enhance the customer journey.

Here are a few ways you can use email to help better understand why people are falling out of your marketing and sales system while also building value to get a few of them back on track.

- In an email, link to a survey asking them a few simple questions to understand better why they've not been in touch. For an example of this type of survey, visit <https://lamplightdigitalmedia.com/example-prospect-survey/>.
- Use email to share written and video testimonials to build trust and help prospects feel confident that others have had a great experience with your team.
- Provide educational content that differentiates you from your competitors. Consider using videos embedded in your email that humanizes your business by showing team members answering frequently asked questions.

Based on how people interact with the survey and these emails, you're likely to discover ideas to improve your internal processes for marketing and sales.

5. Current Customer Campaigns

An overwhelming amount of data shows why increasing customer retention and loyalty is one of the best business decisions you can make to improve profitability and longevity. Over the past

five years, overall new customer acquisition costs have risen more than 60%.²

However, very few companies have successful systems and processes to make this a regular part of everyday business. The great news is that if you can work to improve this area of your organization, it will help you gain and retain market share.

Email marketing is a simple and highly effective tool you can use to make current customer communication a reality. With some up-front planning, automated and third-party managed campaigns can create lasting revenue and goodwill.

Email Marketing Ideas

Here are a few ways you can use email to benefit your customers and your business:

- **Cross-marketing opportunities.** Many companies in the water treatment industry have complementary products. Big blue filters go well before a softener, and reverse osmosis systems go great with a softener for point-of-use. Why not use email marketing to help educate customers who have one but not the other on the benefits?
- **New product/feature launches.** Many of our clients are starting to sell alkaline or remineralization filters. Email marketing provides a cost-effective way to communicate the launch of these new products and provide education to customers on water quality, water treatment, and the benefits of the new feature or product.
- **The seven-year ache.** Do your customers have old or outdated products? Do you have a newer, more efficient, or productive option for them? Cure the seven-year ache and educate customers on how they can save time and money by upgrading. If they haven't heard from you in a while and things aren't working, you can bet your bottom dollar they're shopping around.
- **Nip post-purchase depression in the bud.** Have you ever purchased something only to feel disappointed days after? Post-installation follow-ups can help educate the customer that the system is doing its job and to answer any questions. You can also use email combined with video to educate customers on the product(s) they've purchased and answer frequently asked questions.
- **Newsletters.** Customers enjoy doing business with people who are not constantly asking them to buy. Use newsletters monthly or quarterly to keep in touch with your customers without asking them for anything. Introducing team members, showcasing your involvement in community or industry events, and educating them on important issues can be effective ways to build relationships without asking them to fork out more money.
- **Review and referral gathering.** What better way to grow your business than to have your existing happy customers share their experiences? Email can be a great way to elicit customer feedback, drive reviews, and ask for referrals. The best part is this can be completely automated.

Modern Marketing

Final Thoughts

A few final things to consider when implementing email marketing:

- **Privacy is critical.** Be sure to review legislation regarding data privacy and ensure your campaigns comply. Every email should have a very clear “opt-out” so that people can choose how and if they want to receive emails from you.
- **Avoid overuse of email.** Just like ad blindness is a real thing, so is email blindness. Make sure your emails are not overwhelming to your prospects and customers.
- **Personalization is best.** The more you can personalize your message to meet your audience's individual needs, the better your emails will perform. Ask your marketing partner what is feasible for your business based on audience size and segmentation options.
- **Test, test, test.** Email marketing platforms offer a variety of testing options. From testing audience segments to subject lines to email content, be sure to establish key performance metrics, set up the processes to measure them, and then test away.

Email is far from dead and can be a great tool in the marketer's toolbox when appropriately used and effectively tracked. We hope these five email marketing strategies will help you grow revenue, profits, and brand value going forward. **WCP**

References

1. Hubspot, *The Ultimate Guide to Prospecting*. <https://blog.hubspot.com/sales/the-ultimate-guide-to-prospecting-how-many-touchpoints-when-and-what-type>
2. Hubspot, *The Hard Truth About Acquisition Costs*. <https://blog.hubspot.com/service/customer-acquisition-study>

About the author

♦ Amanda Crangle and the team at Lamplight Digital Media help residential and commercial water treatment companies profitably grow their dealerships using digital marketing. They have worked with over 100 water treatment dealerships spanning North America, managed millions of dollars in ad spend and performed over 1,000 scientific website split tests. Crangle intimately knows the water industry, having worked in a dealership as a sales rep and as a general manager. She and her team are passionate about expanding consumer awareness of water quality issues and providing education on final barrier solutions.



Choose From
THE LEADER!

For over 30 years, Coster Engineering has been manufacturing quality water treatment equipment. Specializing in Reverse Osmosis systems and water vending equipment, Coster Engineering systems remove dissolved contaminants like minerals, salts, metals and organic matter that may be present in a water supply. Coster Engineering has units for a wide variety of industries and applications including:

SUPERMARKETS

BUYING CLUBS

KIOSKS

CAR WASHES

C-STORES

HEALTH FOOD STORES

WATER STORES

BOTTLING EQUIPMENT

OR ANY OTHER PURE WATER NEED

For quality pure water systems, count on Coster Engineering!

For a quote, call or visit our website:

1-800-433-5620
www.costereng.com

A Division of Hiniker Company

PARTNER WITH US TO PROVIDE INDUSTRY-LEADING FINANCE OPTIONS TO YOUR CUSTOMERS

1% FIXED 1% MINIMUM PAYMENT FACTOR
Fast and simple funding process. Grow your business in 2022 with specialty financing for the water industry.

LOW APR PLANS

PRIMARY AND SECONDARY BIDS

DEFERRED INTEREST AND NO INTEREST PLANS

SCAN HERE

- The industry's lowest monthly payment
- 0% interest promotions
- Instant credit decisions
- 100% online application process
- Instant eSign document processing
- Primary and secondary credit approved
- Fast funding

PROVIDING QUALITY WATER SHOULDN'T BE A LUXURY FOR THE FEW, WE MAKE IT AFFORDABLE FOR EVERYONE!

CALL US NOW! 877.965.6865 EXT.1840

@CONTACTUS@THEISPC.COM

THEISPC.COM/MERCHANTS

ABOUT US

The Independent Savings Plan Company (ISPC) is a finance company that has been providing consumer friendly loans to homeowners since 1983. In the early days, the goal was to finance a narrow range of environmentally sound products. Over the years, ISPC has grown substantially and expanded our finance programs to a wider range of products and services.

EXCLUSIVE FINANCE PROVIDER FOR THE LEVEREDGE

People

Machine Learning Can Speed Up Microplastic Counting

Researchers at the University of Toronto's Faculty of Applied Sciences & Engineering have proposed new methods that will use machine learning to make counting and classifying microplastics easier, faster, and more cost-effective.



Elodie Passeport, an associate professor in the departments of civil and mineral engineering and chemical engineering; **Shuyao Tan**, a Ph.D. student in chemical engineering; and **Joshua Taylor**, an associate professor in the department of electrical and computer engineering, worked together on the investigation, which was published in *ACS ES&T Water*. Using an algorithm that will not introduce additional error or variance allows only a small fraction of samples to be manually processed so the rest will be predicted. This project is the first open-source dataset for microplastics image segmentation.



High School Students Design a Bottle that Makes Seawater Potable



Students Laurel Hudson, Gracie Cornish and Kathleen Troy pictured with mechanical engineering associate professor Jonathan Boreyko (second from left) and graduate assistant Ndidi Eyegheleme (far right) in the nature-inspired fluids and interfaces lab. Source: © Peter Means/Virginia Tech

Four high school students have designed a desalinating water bottle that could make seawater potable. The design was inspired by the drinking straws hikers use to purify water, considering if it was possible to make a bottle that could do the same for seawater.

The students (**Laurel Hudson**, **Gracie Cornish**, **Kathleen Troy**, and **Maia Vollen**) met in Virginia Tech's C-Tech² program. The program challenged the four students to "reinvent the wheel," so they focused their assignment on the ongoing global water crisis.

The group has published their findings in the journal *Soft Matter*, and while the design is theoretical, it could prove to provide a way for communities in which drinking water is scarce to be able to rely on seawater to fulfill their needs.

Researchers Develop Techniques to Test Outside of a Lab



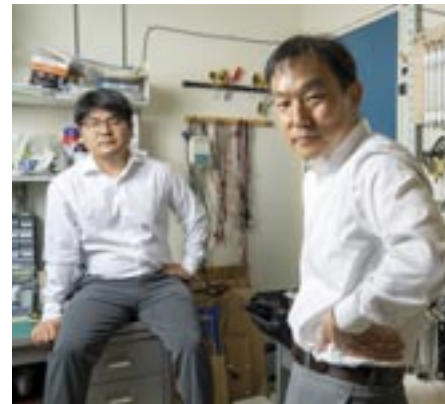
Joe Sinfield, professor of civil engineering, and researchers in his lab at Purdue University's Lyles School of Civil Engineering have created a suite of patented and patent-pending technologies using Raman spectroscopy—a chemical analysis technique that uses light to assess the chemical composition of materials.

This technology allows for chemical analyses on a wide array of sensitive compounds outside of the laboratory, which results in a low-to-moderate cost and little need for expertise of sample preparation. Sinfield's new inventions include addressing interference from fluorescence, addressing problems created by objects in samples that are not usually of interest to researchers, enhancing the Raman system sensitivity to enable chemical analyses in challenging situations, and enabling spatially dispersed analyses.

From Seawater to Drinking Water with the Push of a Button

Researchers at MIT have developed a portable desalination unit that weighs less than 10 kilograms. This new device is

suitcase-sized, requires less power to operate than a cell phone charger, and is packaged in a user-friendly device that runs with the push of a button. The device will automatically generate drinking water that exceeds World Health Organization quality standards.



Senior author Jongyoon Han, pictured right, sitting with Junghyo Yoon.

The research has been published in *Environmental Science and Technology*. Senior author **Jongyoon Han** is a professor of electrical engineering and computer science and of biological engineering at MIT and a member of the Research Laboratory of Electronics (RLE).

Junghyo Yoon, a research scientist in RLE; **Hyukjin J. Kwon**, a former postdoc; **SungKu Kang**, a postdoc at Northeastern University; and **Eric Brack** of the U.S. Army Combat Capabilities Development Command (DEVCOM), are also authors.

This device, unlike others of its kind that require water to pass through filters, uses electrical power to remove particles from drinking water, which eliminates the need for replacement filters and reduces long-term maintenance requirements. The design and function of this device could allow for it to be deployed in remote and severely resource-limited areas. **WCP**

♦ To submit your announcement, please send the information to **WC&P** at info@wcponline.com.

ADVERTISE TODAY WITH WC&P

Display Ads

Marketing Showcase placement

Digital Ads... And more!

We can design an ad package that meets your goals and budget.

Contact **WC&P**
Advertising today:
(703) 725-5131

advertising@wcponline.com

WC&P

PureWaterMachine
by VERTEX

IsoTwist Premium Features
Reverse Osmosis Competitive Price



Twist-off cartridges make installation and replacement quick, easy and sanitary
High Flow 50 GPD membrane makes more clean, great tasting water.
Takes less space than most 4 and 5-stage systems

Low Cost and Convenience in One Model!

Full Range of Models at Affordable Prices



VERTEX
WATER PRODUCTS

(800) 627-2146

www.VertexWater.com

Upcoming Events

Highlighted listings denote WC&P attendance or distribution (subject to change).

June 2022

- 8-10

Aquatech China

Shanghai, PR, China

<https://www.aquatechtrade.com/china/>
- 12-15

AWWA Annual Convention & Exposition (ACE22)

San Antonio, TX, USA

<https://www.awwa.org>
- 15-17

Florida WQA Annual Convention

Daytona, FL, USA

<https://fwqa.com/>
- 19-24

Frontiers in Hydrology: The Future of Water

San Juan, Puerto Rico

<https://www.agu.org/FIHM>
- 21-22

Fate of PFAS: From Groundwater to Tap Water

Westerville, OH, USA

<https://www.ngwa.org/detail/event/2022/06/21/default-calendar/22jun5010>

July 2022

- 25-28

49th Annual TWQA Convention & Exposition

Frisco, TX, USA

<https://twqa.org/events.php>

August 2022

- 23-25

THE WATER EXPO 2022 11th Edition

Miami, FL, USA

<https://www.thewaterexpo.com/>
- 23-1

World Water Week

Stockholm, Sweden

<https://www.worldwaterweek.org/>

September 2022

- 6-8

Aquatech Mexico

Mexico City, Mexico

<https://www.aquatechtrade.com/mexico/>
- 11-15

IAPMO 93rd Annual Education and Business Conference

Charlotte, NC, USA

<https://www.iapmo.org/ibu/events>

- 11-22

IWA World Water Congress & Exhibition

POSTPONED FROM 2021

Copenhagen, Denmark

<https://worldwatercongress.org/>
- 12-16

drinktec 2022

Munich, Germany

<https://www.drinktec.com/index.html>
- 13-15

WQA Mid-Year Leadership Conference

Olympic Valley (Lake Tahoe), CA, USA

<https://mylc.wqa.org/>
- 13-15

One Water Summit 2022

Milwaukee, WI, USA

<http://uswateralliance.org/>
- 14-16

ASEAN Sustainable Energy Week 2022 (ASEW)

Bangkok, Thailand

<https://www.asew-expo.com/2021/en/index.asp>
- 21-23

Eastern WQA Fall Trade Show and Conference

Wilkes-Barre, PA, USA

www.ewqa.org
- 27-28

Canadian Hydronics Conference

Saskatoon, Saskatchewan

<https://www.ciph.com/page/CHC2021>

October 2022

- 5-7

INDOWATER 2022: 16th International Water, Wastewater & Recycling Technology Expo & Forum

Jakarta, Indonesia

<https://indowater.merebo.com/>
- 11-12

The PWQA 65th Annual Trade Show & Convention

Burbank, CA, USA

<https://pwqa.com/>
- 13-15

CGA 2022 Annual Conference

Sacramento, CA, USA

<https://groundh2o.org/events/>
- 13-15

Taiwan International Water Week (TIWW 2022)

Taipei, Taiwan

<https://www.taiwanintlwaterweek.com/en/index.html>
- 15

Global Handwashing Day

<https://globalhandwashing.org/global-handwashing-day/>
- 18-20

Aqua Ukraine 2022

Kiev, Ukraine

<https://www.iec-expo.com.ua/en/aquaen-2022.html>

November 2022

- 6-10

Engineers' Society of Western Pennsylvania 2022 International Water Conference

Orlando, FL, USA

<https://eswp.com/water/overview/>
- 19

UN World Toilet Day

<https://www.un.org/en/observances/toilet-day>

December 2022

- 6-8

2022 Groundwater Week

Las Vegas, NV, USA

<https://groundwaterweek.com/>
- 7-8

Virtual Groundwater Summit

<https://pheedloop.com/Summit2021/site/home/>

February 2023

- 20-23

AMTA Membrane Technology Conference & Exposition

Knoxville, TN, USA

<https://www.amtaorg.com/awwaamta-membrane-technology-conference-exposition>

- 25

33rd Annual Berkeley Springs International Water Tasting

Berkeley Springs, WV, USA

www.berkeleyspringswatertasting.com

March 2023

- 11

World Plumbing Day

<https://www.worldplumbing.org/worldplumbingday/>
- 22

World Water Day

<https://www.worldwaterday.org/>

April 2023

- 18-20

WQA Convention & Exposition

Las Vegas, Nevada

<https://wqa.org/> **WC&P**

♦ To submit your event, please send the information to WC&P at info@wcponline.com.



The ONLY global source

Benefits of KDF® Process Media

- Significantly extend the life of granular activated carbon (GAC)
- 100% Recyclable
- Remove chlorine, iron, hydrogen sulfide, heavy metals and control microorganisms
- Outperform silver-impregnated carbons



This Reduction Condition Media is Tested and Certified by NSF International against NSF 60/62 Standard 42 for material requirements only.



This Reduction Condition Media is Tested and Certified by NSF International against NSF 60/62 Standard 42 for material requirements only.

MEMBER

KDF Media meets AB 1953 California Pb Rule

for KDF® Process Media

Where are KDF Process Media used?

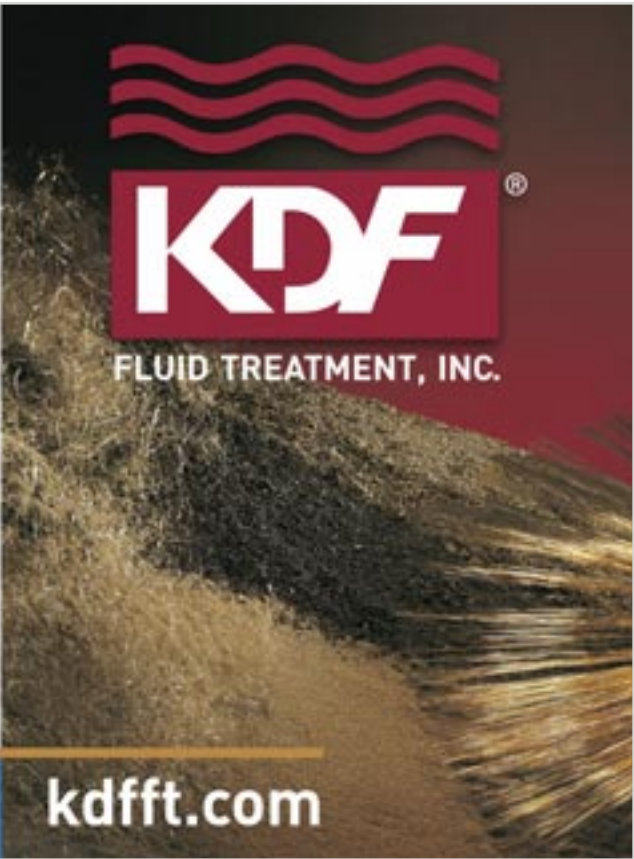
KDF® Process Media are used in a variety of pretreatment, primary treatment, and industrial applications. They are generally used in place of, or in conjunction with, GAC filters, even carbon block or inline filters. Extend the life GAC while protecting the carbon bed against fouling by bacterial growth.

Call or visit our website
1-800-437-2745



Proud Platinum Sponsor

WISHING WELL
Environmental Foundation



RO Essentials: From the Trenches to Your Tumbler

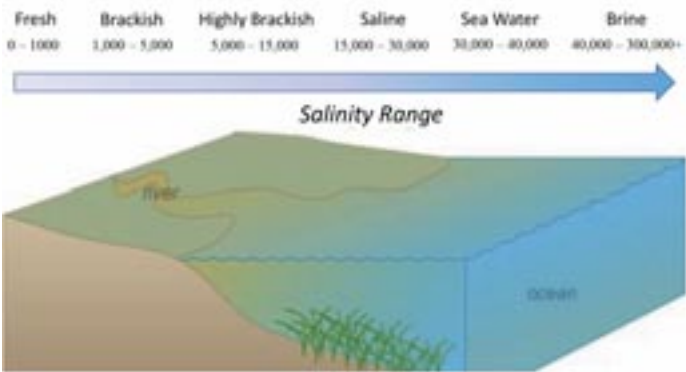
Where does water come from? Does water ever get used up? What's in my water? Is my water safe to drink? How is water made pure to drink? These are common questions that are asked to water treatment professionals because people are becoming more aware of their water quality.

This article addresses the general overview of reverse osmosis (RO) and membrane technology. Before one can understand ROs, a basic education in water contaminants is important. The US Environmental Protection Agency (EPA) categorizes impurities in water by primary and secondary contaminants. Primary contaminants are standards that protect the public health by limiting the levels of certain contaminants in drinking water. These contaminants are things in the water defined as health hazards such as microbials, lead, arsenic, nitrates, DBVs, pesticides, PFAS, etc. Secondary contaminants are non-enforceable guidelines that produce aesthetic and cosmetic effects. These impurities are things in the water that are generally considered “safe” but different states may choose to adopt these as enforceable, so it is important to check your local state codes. Examples of these contaminants include things like color, iron, total dissolved solids, sulfates, chlorides, odor, etc.²

This article is going to focus on total dissolved solids (TDS). TDS is the total weight of solids that are dissolved in the water, given in PPM per unit volume of water. When measuring TDS by electrical conductivity, two probes are placed into a premeasured sample and low voltage is passed between the probes. A higher conductivity reading in PPM is directly related to how many dissolved solids are in the water. When measuring TDS by conductivity, substances that are non-conductive will not show in the results. The water discussed in this article is defined as fresh water, brackish water, and highly brackish water (see Picture 1). An RO membrane removes many different cations, anions, ionized salts, colloids, but they cannot remove low molecular weighted compounds like alcohols

and phenols. Also, membranes cannot remove dissolved gasses like carbon dioxide, methane, or hydrogen sulfide.^{2,3}

Picture 1: The defined ranges of salinity.⁶



Reversing the Osmosis Process

If one could achieve water without any contaminants this would be classified as “pure” water, but since pure water only exists in a theoretical sense, the term “pure” will be substituted for treated or product water for the remainder of the article. The three main ways to treat TDS in water is through distillation, deionization, and reverse osmosis. There are other potential desalination techniques such as zeolitic imidazolate framework membranes or the use of low energy hydrogel super polymers, but these are currently being evaluated and debated. When treating water in a whole house POE application, it is more practical to treat with RO technology because of the return on investment and operation and maintenance costs, such as the amount of energy used for distillation or the maintenance and regenerants used with capacitive deionization or ion exchange deionization.^{4,5}

Osmosis is the natural phenomenon that provides water to plant and animal cells. This natural process is where water moves from a lower TDS medium to a higher TDS medium across a semi-permeable membrane (ex. roots in plants, cells in animals). Reverse osmosis is the process of applying pressure on the higher TDS liquid to push water back through the semi-permeable membrane onto the side that has a lower TDS liquid.

There are three typical membranes used in water treatment: cellulose acetate (CA), cellulose triacetate (CTA), and thin-film composite (TFC). TFC are the membranes described in this article because these membranes are the most ubiquitously used today. This membrane is comprised of a layer of polyester spacer webbing, a microporous polysulfone interlayer, and an ultra-thin polyamide barrier layer on the top surface. These membranes are typically crossflow membranes, which means water flows across them. The water flows across the membrane and straight down the drain because water takes the path of least resistance. As the drain water is restricted, the water that wants to flow to the drain is forced across the membrane and then the contaminants build up on the surface of the membrane as they are removed. The more restriction applied to the drain water, the more permeate water is created but the quicker membrane fouling occurs. The less restriction applied to the drain water, the less permeate water created, but the membrane is more resistant to fouling. Also, the less restriction the better the membrane is getting cleaned by the cross-water flow.¹

Picture 2: The cross flow of water across an RO membrane.¹

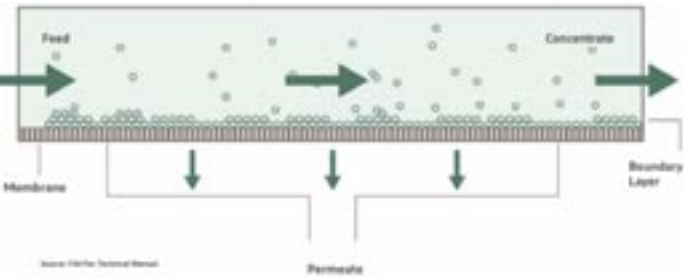


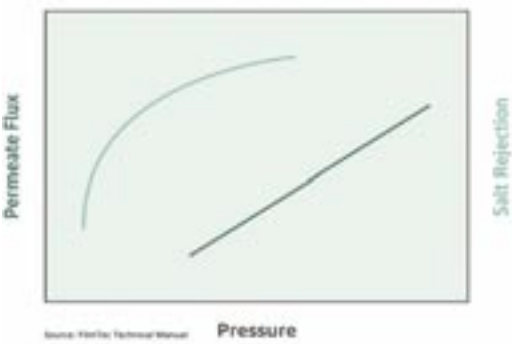
Table 1: RO Key Terms.

- | |
|--|
| Permeate <ul style="list-style-type: none">• Good water or product water produced by membrane. |
| Concentrate or Rejection <ul style="list-style-type: none">• Essentially the drain water or percentage of solute concentration removed from feedwater by the membrane• Percent rejection is feedwater TDS minus permeate TDS divided by feedwater TDS x 100. |
| Recovery <ul style="list-style-type: none">• Percentage or ratio of permeate flow rate divided by feedwater rate x 100.• 100% recovery is obtained by shutting off concentrate/reject water. |
| Passage <ul style="list-style-type: none">• Opposite of rejection.• Percentage of dissolved contaminants in the feedwater that passes through the membrane. |
| Flux <ul style="list-style-type: none">• The rate of permeate transported per unit of membrane area. Measured in gallon per square foot per day. |

RO Performance, Ratings, and Requirements

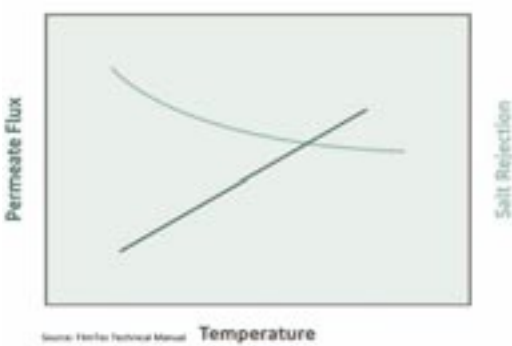
There are many factors that affect RO performance and ratings. Membranes are rated at 500ppm of TDS at 77°F (25°C) with a pH of 8.0 at 50 psi. A 50 gpd (gallons per day) rated membrane may not produce 50 gpd because of varying factors. Factors that affect performance include pressure, temperature of the water, recovery, and feedwater TDS. The following are examples of how each of these affect performances.

Graph 1: Performance vs Pressure.¹



Graph 1 shows the relationship between pressure and performance, so as pressure increases, salt rejection increases and as the pressure increases the membrane makes more product water.

Graph 2: Performance vs Temperature.¹



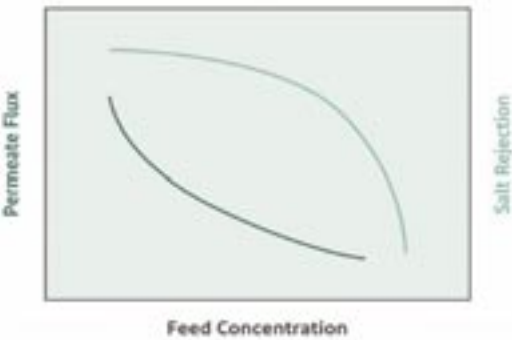
Graph 2 shows the relationship between performance and temperature. As the temperature increases, salt rejection decreases slightly but the membrane makes more water.

Graph 3: Performance vs Recovery.¹



Graph 3 shows performance versus recovery, there is a point at which one tries to recover too much concentrate, and both permeate flux and salt rejection drops off.

Graph 4: Performance vs Feedwater Salt Concentration.¹



Graph 4 shows performance versus feed water TDS. Higher TDS coming into the membrane means there will be less product water and less TDS rejection. Table 2 shows recommended feed water concentrations for membranes, pre-treatment solutions, and the potential problems if feed water is out of the specifications.

Table 2: Typical Water Chemistry and Pretreatment for RO Systems.

Recommended Feed Water	Potential Effect	Pre-Treatment Solution
TDS: < 2,000 ppm	Reduced production rate, increased salt passage	New water source
Total Hardness: < 6 gpg	Scaling of membrane surface, reduced production rate	Water softener
Total Iron: < 0.3 ppm	Fouling of membrane surface, reduced production rate	Oxidation filter or water softener
Tannins: < 0.5 ppm	Fouling of membrane surface, reduced production rate	Tannin filter
Chlorine: < 0.1 ppm	Permanent membrane damage, increased salt passage	Carbon filtration
pH: 5.5 – 9.5	Internal corrosion, lime scaling	pH adjustment
Organic or Microbiological: 0	Fouling of membrane surface, reduced production rate	Chlorination or UV
Manganese: < 0.05 ppm	Fouling of membrane surface, reduced production rate	Oxidation filter or water softener
Hydrogen Sulfide: 0 ppm	Internal corrosion, fouling of membrane surface, reduced production rate	Oxidation filter
Turbidity, SDI < 5.0	Plugging of membrane, reduced production rate	Pre-filtration

Picture 3: 50 GPD POU RO System with Easy Quick-Change Filters.



POE and POU RO System Anatomy

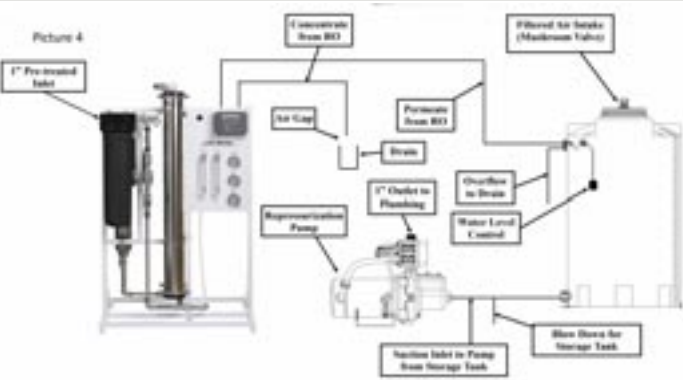
POU RO systems are rated by stages, which is defined by how many filters are installed on the flow path. Picture 3 shows a typical 50 gpd, 5-stage POU RO system. The first three stages in the system are pre-membrane treatment to reduce suspended solids, chlorine, and chloramines in the feed water. This helps protect the membrane and reduce contaminants like low molecular weight molecules and hydrocarbons. Water flows through the auto drain shut off (ADS) to the fourth stage, which is the membrane, and the water is split into concentrate and product water.

From there the product water flows through a check valve and the ADS that shuts off the incoming water once the storage tank fills. The concentrate water flows to the drain via a capillary drain flow restrictor, or other forms of concentrate restrictors like a needle valve. The final product water flows from the storage tank through the fifth stage polishing filter to remove any unwanted taste and odor from the system.

Also, it is important to note that POU RO system performance changes with feed water TDS, pressure, temperature, and differential pressure. Differential pressure is the pressures at two points in a water system. In a POU RO, this is the pressure difference between the incoming water and the water stored in the pressurized bladder tank. Storing water in an atmospheric tank will reduce the backpressure and differential pressure. This reduced back pressure will increase permeate production and quality of the product water.³

POE RO systems are customizable, meaning there are different ways to flow membranes, drains, and different installed features like gauges, meters, controllers, pumps, and filters depending on applications and markets served.

Picture 4: 2,400 GPD POE RO with Typical Atmospheric Installation



Picture 4 is an example of a POE RO system setup. Most system setups will start with pretreatment to remove some contaminants out of the water, then the water will pass through a pre-filter and then the RO membrane(s) and to a holding tank. Out of the holding tank the water is pumped into the plumbing system. If this water is used for potable applications, then a UV system is typically used after the storage system to keep down microorganisms. If this water is used in a plumbing system that contains metals like copper or brass, then the water is neutralized by a neutralizing system that contain calcium carbonate, magnesium oxide, or through soda ash injection.

Customized Stages of POE ROs

POE ROs can be defined by different stages of membranes. A single-stage system is where feed water is passed through a single membrane. A single-stage system can also include a concentrate recycle, in which some of the concentrate water is fed back to the feed water side of the membrane. This helps reduce waste from the system.

A two-stage system is where water is passed through a single membrane or membranes in parallel and the concentrate water

is sent through a second membrane with the product water tied together. The two-stage system can also have a concentrate recycle where the second stage membrane's concentrate is sent back to the feed water.

A single-pass system is where water is passed through a single membrane only. A double-pass system is where the product water is passed from a series of membrane to another series of membranes. The system can also have a concentrate recycle from the final membrane to keep down on waste. POE ROs can also have membrane flushes where water is bypassed around the flow restrictor to flow water at a higher gallons per minute to help clean contaminants of the membrane boundary layer. This water can be a simple feed water flush or a more complicated permeate flush.

Conclusion

Membrane technology is the core to an RO system. But POU and POE RO performance can vary between manufactures. It is important, when comparing RO systems, that one looks at how many stages, passes, features, membrane housing material, ease of maintenance and filter change, pump and motor quality, and controller features. These subtle changes in design can swing RO performance, pricing, and environmental waste. **WCP**

References

- Dupont. (2021, December 1). *FilmTec™ Reverse Osmosis Membranes Technical Manual*. Water-Solutions. Retrieved April 1, 2022, from <https://www.dupont.com/content/dam/dupont/amer/us/en/water-solutions/public/documents/en/RO-NF-FilmTec-Manual-45-D01504-en.pdf>
- Environmental Protection Agency. (n.d.). *How EPA Regulates Drinking Water Contaminants*. EPA. Retrieved April 17, 2022, from <https://www.epa.gov/sdwa/how-epa-regulates-drinking-water-contaminants>
- Harrison, J. F., & McGowan, W. (1993). *Wqa Glossary of terms*. Water Quality Association.
- Karamchedu, C. (2016, October 10). *Addressing global water scarcity with a novel hydrogel-based desalination technique using saponified starch grafted polyacrylamide's hydrophilic properties to harvest fresh water with a low energy and chemical footprint*. IEEE SusTech. Retrieved April 17, 2022, from https://iee-sustech.org/wp-content/uploads/sites/261/2016/10/CK_desalination-abstract.pdf
- Li, J., Zhao, Z., Yuan, S., Zhu, J., & Bruggen, B. V. (2018). High-performance thin-film-nanocomposite cation exchange membranes containing hydrophobic zeolitic imidazolate framework for monovalent selectivity. *Applied Sciences*, 8(5), 759. <https://doi.org/10.3390/app8050759>
- Louisiana's oil. Wetlands and Coastal Erosion. (n.d.). Retrieved April 17, 2022, from <http://www2.southeastern.edu/orgs/oilspill/wetlands.html>

About the author

Stephen Hamilton currently serves as the national sales manager – wholesale and distribution at Franklin Water Treatment, LLC. He has a bachelor's degree in pre-medicine from Olivet Nazarene University with a background in biology and a minor in chemistry. He has over a decade of experience in the water treatment field. He previously served as a factory worker, technical advisor, system design, and commercial water treatment specialist for Franklin Water Treatment, LLC. In addition to his current role, he is also one of the managers of the Churubusco facility for Franklin Electric Co. He can be reached at Stephen.Hamilton@fele.com.



About the Company

Franklin Electric is a global leader in the manufacturing and distribution of products and systems focused on the movement and management of water and fuel. It offers pumps, motors, drives, and controls for use in a wide variety of residential, commercial, agricultural, industrial, and municipal applications. Learn more at fele.com.

The advertisement for the Water Well Trust features a collage of photos showing diverse groups of people and a well. The text reads: "WATER CHANGES LIVES. The Water Well Trust is working nationwide to drill water wells for rural homeowners without access to a public water supply. waterwell trust. Learn how we can help @ waterwelltrust.org 202-625-4383".

Balancing Reverse Osmosis and Storage Tank Sizes

The primary production technology for commercial and industrial water treatment applications is reverse osmosis (RO). The reason for this is that RO is chemical-free and it is the “great equalizer” for dissolved solids. Across a wide range of feed water levels of dissolved solids, the RO product waters will lie within a relatively small range:

Raw water comparisons	100 ppm	200 ppm	300 ppm	(Range 200 ppm)
RO product	02 ppm	04 ppm	06 ppm	(Range 4 ppm)

This is the reason why regional and national beverage franchises use the RO as a common water treatment. No matter the local feed water dissolved solids level, the product beverage will have the identical taste at each franchise location.

Commercial reverse osmosis units are rarely sized by production rate (gallons per minute) because the rate of cost increase with increased RO size is prohibitive. **Figure A** shows a rough comparison of increased capital purchase cost versus increased RO production rate.

Additionally, with increased RO size comes a necessary increase in the size of pretreatment flow rate and their required assemblies. This does not even include the increased operating and maintenance costs of electrical power and membrane replacements. Consequently, commercial RO systems are most often sized by the RO production over a 24-hour period, taking into account the gallons per day (GPD) rather than the gallons per minute (GPM). However, since the water use requirement may at times exceed the production flow of the RO, commercial ROs are typically matched with a storage tank as a reservoir to provide distribution

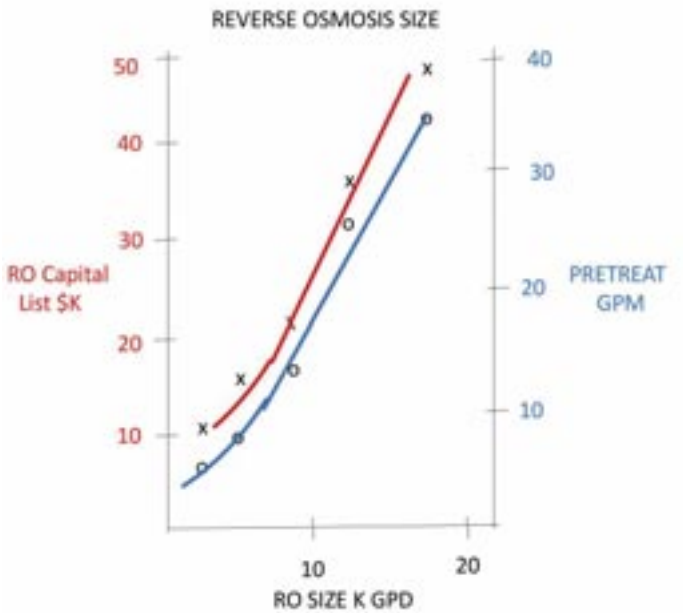


Figure A

of the RO product water as required by the application. Water from the storage tank is then distributed with a pump to the point of use as required. This article will describe a suggested procedure to determine the best combination of RO and storage tank.

The balance relationship is pictured in **Figure B**: cost versus space available. The recommended procedure for specifying the combination of RO and storage tank sizing follows three parts including eleven steps.

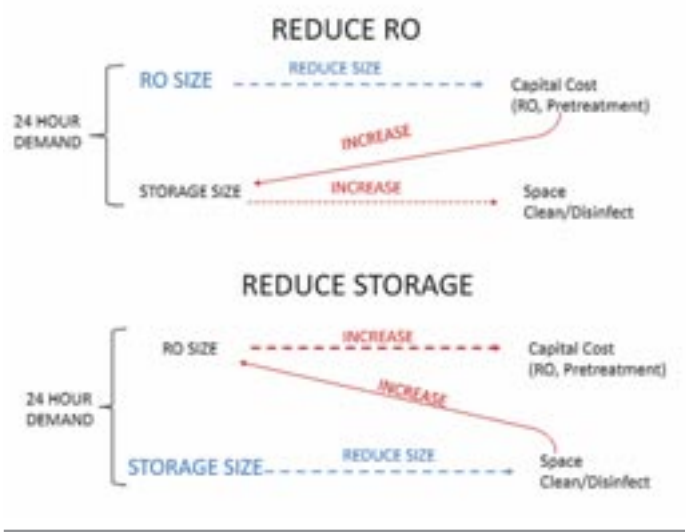


Figure B

Part One: Specify the RO Size.

We will assume feed water from a source which meets the USEPA drinking water standards.*

1. Select minimum RO size.

The minimum size for an RO unit is determined by the total volume of treated water required by the application over the most demanding 24-hour period. This volume will be application specific. However, before selecting the RO, an allowance must be made for both maintenance down time, and effects of temperature upon RO performance. For our example, we will use a 24-hour production demand of 4000 GPD.

2. Allow for maintenance time.

RO units are sized based upon their production over a 24-hour period. However, I suggest that at least 2 hours per day be allowed for maintenance downtime. The maintenance time will provide a time window for the pretreatment (hard water bypass) filters and softeners to regenerate. Other maintenance considerations, such as a Clean-In-Place protocol may warrant extension of this allowance. For our example, this means that the base production volume must be multiplied by 24/22 or 1.09. So we modify our demand to 4360 GPD (4000 X 1.09). We will need a larger RO in order to produce the required volume in only 22 hours rather than 24.

3. Allow for temperature effects.

RO manufacturers size their units based upon their production with a standard feedwater temperature of 77 degrees Fahrenheit. However, unless tempered water is used, the feed water will normally be less than 77. Typically, for most temperate climates, municipal feed water will be at 65 degrees and well water will be at 55 degrees. The exceptions for municipal water will be in the Gulf and Southwestern states, where the feedwater temperature will be higher, and the Midwest where winter temperatures may be lower. Due to the significance of this factor, it is advisable to consider the actual local feedwater temperature. These temperature effects are specified by the RO membrane manufacturer. A typical temperature conversion table is at Figure C. Assuming

a municipal feed source, we estimate a feedwater temperature of 65 degrees, and so modify our sizing demand to 5450 GPD (4360 X 1.25). Again, a larger RO is required to produce the required volume with feedwater colder than 77 degrees.

TEMPERATURE CORRECTION FACTORS	
Feed Water (Fahrenheit)	TCF*
35	2.3
40	2.0
45	1.8
50	1.65
55	1.6
60	1.35
65	1.25
70	1.1
77	BASELINE 1.00
80	0.94
85	0.86
90	0.81

*TYPICAL FOR TFC MEMBRANE (CONSULT MANUFACTURER)

Figure C

4. Select candidate RO.

Commercial reverse osmosis units are specified in production steps of about 1500 GPD since most use the 4”D X 40” L membranes, and each can produce about 1500 GPD (at 77 degF) with higher production rates with larger systems. Typical RO sizes include 1500 GPD, 3000 GPD, 4500 GPD, 6000 GPD, 8000 GPD, 10000 GPD, 11500 GPD. For industrial-sized systems requiring in excess of 25,000 GPD, RO systems with 8”D X 40”L membranes may be preferred. These membranes produce about 6000 GPD at 77 degF. In our commercial case, in order to ensure that the product will be at least 5450 GPD, we would select a four-membrane (4”D X 40”L) unit with a production estimate of 6000 GPD.

5. Apply the temperature effects for actual performance by the candidate RO.

Application of the temperature effects requires division by 1.25. This further reduces the RO production to 4800 GPD (6000 / 1.25)

Part Two: Balance of RO Size with the Storage Tank.

1. Calculate the hourly production estimate for the RO.

Divide the RO 24-hour production rate by 24 hours to specify the hourly production rate (GPH). In our test case that will be 200 gallons per hour (4800 GPD / 24 hours).

2. Specify the use profile of the application.

This step is critical. The actual estimated consumption by the application must be specified for each of the 24 hours of the most

demanding day. This use profile will be added to a production profile. See Figure D for the suggested format. The projected hourly water use volumes are added in the USE row.

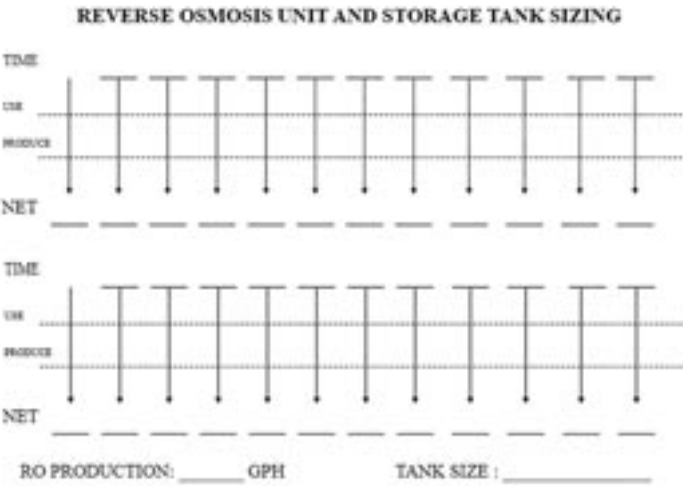


Figure D

3. Calculate the projected RO production quantities based upon the water use profile.

See Figure E for an example of a completed form. Begin the procedure with 0 NET water, and only “operate” the RO when the water USE requires it. When operating, the RO can produce up to its hourly maximum (200 GPH). At each hour when the system uses water (i.e., USE), subtract the USE quantity, add the PRODUCE quantity, and add the NET for the hour on the next line. The form is completed for the entire 24-hour period.

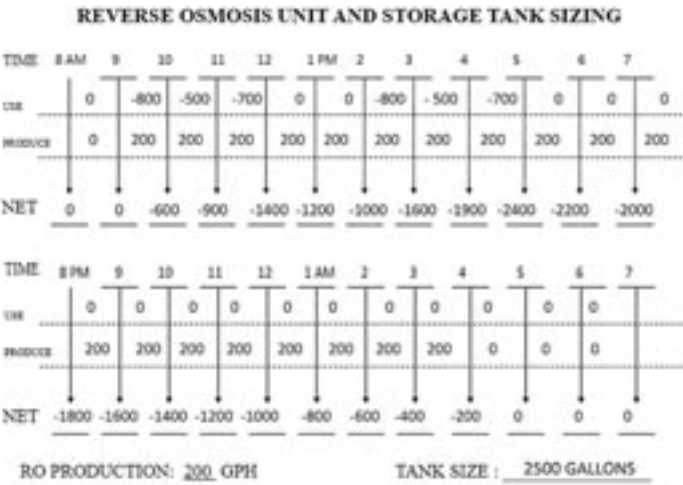


Figure E

4. Select the storage tank size.

Select the highest (most negative) NET over the 24-hour production profile. In this case it is 2500 gallons. Therefore, for this use profile, a solution will be 6000 GPD RO coupled with a 2500-gallon storage tank.

Part Three: Confirm specification of the RO and storage tank.

1. Test the storage tank size.

A typical 2500-gallon storage tank varies between 8.5'D X 6.6'H and 7.5'D X 8.8'H. If either of these dimensions will fit the available space, then the recommendation would be a 6000 GPD RO with a 2500-gallon storage tank.

2. Modify the combination if necessary.

If this 2500-gallon tank is too large for the available space, then, select the next larger RO: 8000 GPD. Applying the same process, we apply 6400 GPD (8000 / 1.25 for temperature) and 266 GPH to our use profile which results in a storage requirement of 1872 gallons. This sizes up to a 2000-gallon storage tank, can measure either 5' 3" diameter by 10' high or 9' diameter by 6' high.

This process may be applied multiple times to fit a specific available space.

*For non-standard feed water, recommend consult with Peter Cartwright, *RO System Design Workshop*, Water Quality Association. **WC&P**

About the author



Following an education in chemistry (BS Degree) at Georgetown University, graduate work at Wayne State University and a 27-year career with the US Marine Corps, Lawrence R. 'Larry' Zinser has served an additional 27 years in design, manufacture, education and troubleshooting of residential, commercial and industrial water treatment systems. He has provided numerous technical courses throughout the country and internationally, which have been accredited by the Water Quality Association, the Pennsylvania, North Carolina, Maryland, Virginia, and Delaware Ground Water Associations, the American Nephrology Nurses Association and the Lehigh-Carbon County Community College. Zinser can be reached at larry@masterwater.com or cell phone, (215) 421-7115.

About the company

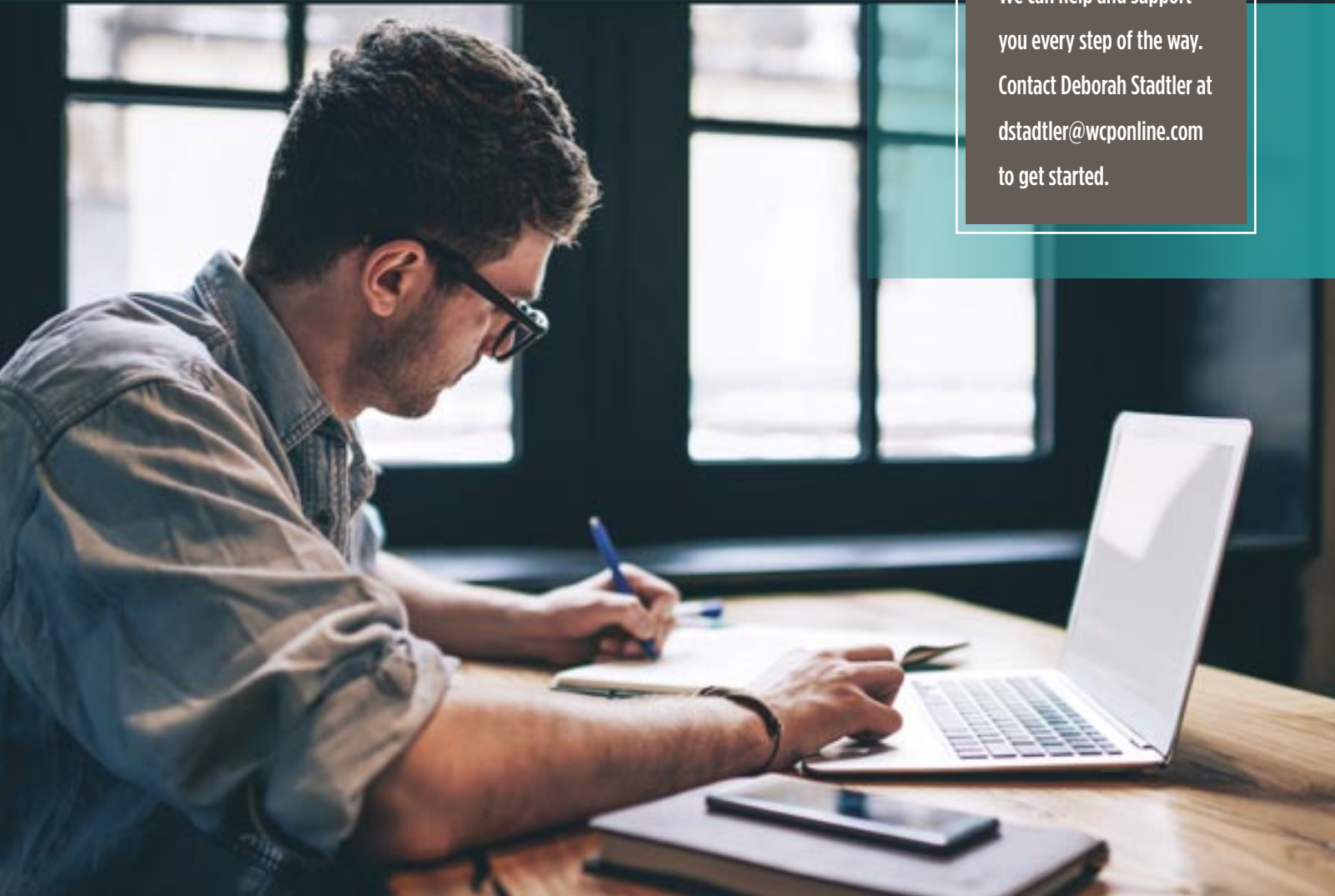
Master Water Conditioning, founded in 1967, is based in Pottstown, PA. It offers residential, commercial and light industrial products and systems to address a wide range of water issues. The company's products include POE water softeners, filters and ultrafiltration systems, which are sold under the Alliance, Clarifier, MasterFusion, Satin, PuroPro, UltraPro and Clear Reflections brands, among others. The company's team of professionals work hard for the industry and are proud to be a respected market leader for innovative, high-quality products and market knowledge. Master Water Conditioning proudly joined the A. O. Smith family in 2021 as part of A. O. Smith North American Water Treatment.

SUBMIT AN ARTICLE TO WC&P

WC&P relies upon water treatment professionals sharing their knowledge and expertise. Professionals at all levels of experience and from any size company are encouraged to submit an article.

Articles should be on a topic related to POU/POE water treatment, such as reverse osmosis, UV, membrane filtration, pools and spas, groundwater, wells, water reuse, and more. Technical articles are welcome, and also articles on running a family business, sales, and other business topics. Do you have an interesting or funny story about a water treatment project?

We can help and support you every step of the way. Contact Deborah Stadler at dstadler@wcponline.com to get started.



How Is Your Boiler Layup Faring This Summer?

June has rolled around, which means you have probably already shut down any of your boilers used for winter facility heating and moved on to other tasks. The question that remains is, how is your boiler faring right now, and how will you know if your seasonal boiler layup technique was successful by the time fall arrives? Since seasonal boiler layup procedures can range anywhere from turning off the boiler and leaving it full of water, to draining and adding desiccant, or implementing a full-fledged nitrogen purge, it is good to be aware of how your specific processes are impacting your boiler system and if they are worth the apparent return on investment.

The issue at stake is corrosion, which may or may not develop depending on your layup procedure and other circumstantial factors. Although discovering corrosion at the end of layup will not allow you to reverse the effects of what is happening in your boiler right now, it will provide the next best option: evaluating the results and becoming wiser for the future so you can take a new route to boiler layup next year if necessary.

Although discovering corrosion at the end of layup will not allow you to reverse the effects of what is happening in your boiler right now, it will provide the next best option: evaluating the results and becoming wiser for the future so you can take a new route to boiler layup next year if necessary.

Fall Boiler Startup: The Moment of Truth

When fall and cool weather return, it will be time to bring the boiler back online. This is the moment of truth when you will

discover if corrosion protection was effective or deficient during layup. *(Note: For proper evaluation, it is good to apply a blend of oxygen scavengers and metal passivators to minimize the potential for pitting corrosion from high dissolved oxygen content levels in the unheated makeup water during startup itself. This levels the playing field to better isolate the true results of the layup itself, rather than introducing additional corrosion.)*

The main indicator of corrosion is out of balance water chemistry, e.g., high iron levels. High iron levels signal that corrosion is taking place somewhere in the boiler—whether in the steam line, condensate line, feedwater tank, or boiler proper. This represents a loss of integrity in the steam system and also throws off the water chemistry, circulating iron contaminants throughout the boiler. Additional indicators include clogging of the system with corrosion products or, in serious circumstances, leakage. All these issues require extra time and labor to solve the problems.

If the boiler does show signs of corrosion after layup, it would be wise to reconsider the layup method and look for a more effective option next time. If results prove to be tolerable, it can still be beneficial to reevaluate traditional methods of layup for the sake of greater convenience, if not greater effectiveness.

Disadvantages of Common Layup Methods

There are several common methods of seasonal boiler layup. The easiest is to do nothing and hope for the best. Other options include applying quick lime or silica gel to absorb moisture, using a positive dry air flow to prevent moisture accumulation, or performing a nitrogen purge to maintain an inert environment with zero oxygen. These methods and their pros and cons are outlined in the chart below.

Factors to Consider	Quick Lime	Silica Gel	Positive Dry Air Flow	Nitrogen Blanket	Doing Nothing
Method of Protection	Moisture absorption	Moisture absorption	Preventing moisture accumulation	Maintaining inert environment	Chance
Thorough Drying Required?	Yes	Yes	Yes	Yes	No
Maintenance Required?	Yes	Yes	Yes	Yes	No
Convenient to Apply?	No	No	No	No	Yes
Easy to Apply?	No	No	No	No	Yes
Subject to Failure?	Yes	Yes	Yes	Yes	Yes
Removal Required?	Yes	Yes (typically)	Yes	Yes	No
Health & Safety Concerns?	No	No	No	Yes	No



New boiler tubes (shiny) alongside old tubes damaged from corrosion that could be the result of a non-existent or inadequate preservation program. Cortec® image.

One of the first challenges is achieving a perfectly dry environment. This in-and-of-itself is a major hurdle given the intricacies of a boiler and the many places for residual water to collect after the boiler has been drained. Another nuisance is the periodic maintenance required for each active method of protection. For example, since silica gel absorbs moisture, it needs to be

VCI technology has been applied successfully to the water treatment industry for several decades and is now available in an increasing array of formats to adapt to various boiler sizes or layup methods (e.g., wet, dry, or wet-dry).

checked periodically and replaced if the desiccant is spent. Otherwise, damp silica gel could itself be the cause of corrosion. Positive dry airflow and nitrogen blanketing require special equipment and must be maintained for the duration of layup to be effective. In the case of nitrogen blanketing, if the system depressurizes and the nitrogen leaks out, the costly procedure will have to be done all over again. Leaking nitrogen poses health and safety hazards, as well. Each active method also requires labor for removal when layup is over. In some cases, such as desiccant use, failure to take the material out of the boiler before refilling it can be worse than doing nothing because of the problems it causes and the headaches that come from having to clean the desiccant out of the boiler once it has been dispersed in the water. In the end, even if the costliest precautions have been taken, the layup may still be ineffective and result in corrosion.

Time to Take a New Layup Route?

Vapor corrosion inhibitor (VCI) layup technologies offer alternatives to other methods that show themselves to be ineffective or inconvenient. VCI technology has been applied successfully to the water treatment industry for several decades and is now available in an increasing array of formats to adapt to various boiler sizes or layup methods (e.g., wet, dry, or wet-dry).

One of the key advantages of VCI technology is its multi-phase corrosion protection action, which translates into a variety of benefits. Because VCI works in the vapor phase, it can be used to protect the internals of an empty boiler or the headspace above the water level without requiring direct application to the metal. Rather, the corrosion inhibiting vapors diffuse through the air and adsorb in a protective molecular layer on all accessible metal surfaces inside the boiler as long as the vapors cannot escape (i.e., boiler openings are closed). VCI also dissolves in the water so that it is able to protect all metal surfaces in contact with the treated water below the waterline. In this way, VCI technology

provides full coverage of boiler internals whether or not the boiler is drained.

VCI technology has benefits in terms of convenience as well. Since VCI protects even in the presence of water, there is no need to ensure that residual water is completely dried out of the boiler before layup. Once the VCI has been applied and the boiler openings closed, no further maintenance is required until startup, other than the good practice of applying and periodically checking corrosion coupons to confirm active corrosion protection. VCI does not typically need to be removed upon startup. Also, the products do not have serious health and safety concerns if basic personal protective equipment is used.

Another benefit of VCI technology is that it is versatile when it comes to different methods of boiler layup—dry, wet, or wet-dry. A classic example of VCI *dry* boiler layup is the annual practice of placing a water-soluble film tube filled with VCI powder into the waterside of a boiler, slitting the film open to release the protective vapors, and closing the boiler openings to keep the VCIs trapped inside the system. When the boiler is refilled at startup, the water-soluble film and VCI powder simply dissolve, eliminating the need for removal.



A classic example of VCI dry layup: VCI powders packaged in a water-soluble tube that dissolves when the boiler is refilled. Cortec® image.

Another *dry* layup method is to apply VCI waterborne fogging fluid. This is suitable for and adaptable to protecting both the smallest and largest (e.g., heat recovery steam generators) of boilers as an excellent cost-effective alternative to nitrogen blanketing. Boilers are then sealed for layup, and there is typically no VCI removal or flushing necessary when the boiler is restarted.

VCIs for wet layup are added to the boiler water and circulated, but little maintenance is required other than an occasional check to make sure all remains stable. VCIs protect metals below and above the waterline and do not need to be flushed out when the normal water treatment chemicals are added for the period of operation.



Pitting corrosion on steam drum separators, likely caused by a deficient wet layup. Cortec® image.

A fourth method of VCI layup is the *wet-dry* layup option, where the VCI is added to the water and left to dwell in the boiler for 24 hours before draining. This option has the benefit of not even requiring the boiler operator to open the boiler before layup.

Factors to Consider	VCI Layup Technology
Method of Protection	Surface adsorption
Thorough Drying Required?	No
Maintenance Required?	No
Convenient/Easy to Apply?	Yes
Subject to Failure?	No
Removal Required?	No
Health & Safety Concerns?	No

VCI Layup Precautions

While the various forms of VCI technology available allow users to avoid startup issues by means of safe and convenient application options, it is also important to be aware of specific product precautions. For example, VCI powder used in a boiler exposed to wet and dry cycles over several months can eventually get hard and difficult to remove. In this type of application, the user should take care not to put a water-soluble bag of VCI powder in an area that is prone to getting wet and dry throughout the layup period. Another option is to spray a VCI liquid into the boiler internals to avoid any potential issues with water in the boiler during the layup season.

When properly applied, VCI technology is effective for several months—even years—without having to be replaced. However, for long-term preservation or mothballed equipment, a corrosion monitoring program is always recommended in order to detect a loss of VCI chemistry and replenish the system.



Orange/reddish color in the tube sheet of a firetube boiler suggests some corrosion has occurred in the fireside. Cortec® image.

Make Plans Now to Evaluate Your Boiler Layup Effectiveness This Fall

In the middle of summer, it may seem like the only option left is to sit tight and hope for the best until seasonal boiler layup is over. However, it is a great time to start making plans for evaluating the effectiveness and ease of your current boiler layup method. First, plan to check the condition of your boiler at fall startup time. If, upon examination, the telltale signs of corrosion are present, consider using VCI protection. If all looks well, be thankful, but also consider whether the effort and expense invested in last spring's layup was the best use of resources compared to the convenience of VCI alternatives. WCP

About the authors

♦ Scott Bryan is Technical Sales Manager for water treatment at Cortec® Corp. He can be reached at sbryan@cortecvci.com.

Julie Holmquist is Marketing Content Writer at Cortec® Corp., St. Paul, Minn. She can be reached at jholmquist@cortecvci.com.

About the company

♦ Cortec® Corporation provides cost-effective, user-friendly integrated solutions for corrosion problems in the packaging, metal-working, construction, electronics, oil and gas, and many other industries. Learn more at <https://www.cortecwatertreatment.com/>.

Follow us on Social Media!

 @WCPonline

 <http://bit.ly/WCPLI>



WE JUST CAN'T STOP INNOVATING

What's next?

ENPRESSinnovation.com

ATOMUS ONE Vortech

QR CODE

Formalizing the Approach to Testing Scaled-Down POE Systems for Contaminant

The NSF/ANSI Drinking Water Treatment Units (DWTU) Standards include requirements for both point-of-use (POU) and point-of-entry (POE) water treatment systems. However, other than water softeners under NSF/ANSI 44, most of the evaluation and certification work conducted by the various certification bodies has centered around POU systems.

There have not been nearly as many third-party certifications of POE systems as POU systems. Part of the reason for this is that more POU systems are manufactured and sold compared to POE systems. POU systems typically have lower price points and are often easier to install than POE systems. POU systems also specifically treat drinking water, as opposed to POE systems that treat water used for laundry, dishwashing, showering, etc. For some applications including treatment of drinking water, POU systems have more popularity. However, there are other reasons why most certification of drinking water treatment systems has focused around POU.

Challenges with Testing POE Systems

Chemical reduction testing under the NSF/ANSI DWTU Standards is conducted with an end point based on the manufacturer's rated treatment capacity for aesthetic chemical contaminants, and beyond the rated capacity for health-related chemical contaminants. For typical POU systems with rated capacities in the range of 100 gallons to 1,000 gallons, the chemical challenge through the test end point can be completed in a week or two on the laboratory test bench.

POE systems can have much, much higher rated treatment capacities compared to POU systems. And even with the higher flow rates typical of POE systems, these high treatment capacities can mean that tests require several weeks to several months on the test bench to reach the end point. In addition to the factor of the time required to reach the test end point, the volume of test water required can be enormous. Preparation of very large volumes of test water is time consuming and expensive for the laboratory, which means it is costly for the manufacturer as well. Ultimately, the length of time and cost of testing is a deterrent to manufacturers considering third-party certification of POE systems for chemical reduction.

The Need for Third-Party Certified POE Systems

There are some drinking water contaminants that are health concerns not only when ingested, but also when inhaled, or when in contact with skin, such as in a shower environment. One example that has recently had some focus is 1,2,3-Trichloropropane (1,2,3-TCP). In July of 2017, the State of California implemented a State Maximum Contaminant Level (MCL) for 1,2,3-TCP of 0.005 µg/L, or 5 parts per trillion (ppt).¹ Exposure to 1,2,3-TCP can occur through ingestion, and also through dermal (skin) contact, and inhalation.²

Because the exposure to 1,2,3-TCP is from inhalation and dermal contact, in addition to ingestion, it is preferable to treat water contaminated with 1,2,3-TCP being used for drinking and bathing, which points to a POE solution. And with this chemical contaminant being regulated by the State of California, there is a strong drive to have POE systems that are third-party certified for reduction of 1,2,3-TCP that can be relied upon with confidence by homeowners dealing with 1,2,3-TCP contamination.

Actions Taken by the NSF Joint Committee on Drinking Water Treatment Units

The issue of POE testing and certification, the associated challenges, and market needs was discussed at the October 2020 meeting of the NSF Joint Committee. Based on this discussion, the concept of laboratory testing of scaled-down versions of POE systems for contaminant reduction was embraced. Testing of scaled-down versions of POE systems can reduce the overall water consumption in the laboratory and reduce costs. In fact, three of the third-party certification bodies involved in the discussion indicated that they were already utilizing their own technically justified scale-up calculation procedures, which allows them to work with scaled-down versions of POE systems in their testing and certification programs.

The Committee created a task group charged with considering adopting a specific approach for evaluation of scaled-down POE systems for contaminant reduction into NSF/ANSI 53. The group considered the engineering dynamics of testing and scaling up, along with appropriate calculations. The group focused on clearly defining the chemical test requirements for POU versus POE devices in each subsection of Section 7 of NSF/ANSI 53. In order to provide as much clarity as possible, the task group also developed an informational annex providing examples of the scale-up process for units. Based on suggestions from the NSF Joint Committee, the task group also updated Sections 6.3 and 6.9 of NSF/ANSI 53, relating to flow control and pressure drop requirements for POE systems.

Outcomes of the Task Group's Work

The new requirements developed by the task group clarify the test requirements for POU vs. POE systems in each relevant subsection of Sections 6 and 7 of NSF/ANSI 53. An informational annex that includes examples of how to scale up units with granular media of all kinds and units with carbon blocks was created. Additional clarifications to the new requirements were created, based on feedback from the NSF Joint Committee, including:

- Clarifying that POE systems are exempt from flow control requirements put in place for POU systems.
- Adding backwashing to the full-scale and scale-up test procedures for POE systems where the full-size unit needs backwashing.
- Allowing two ways to test POE systems for chemical reduction:
 - » Using one full-size POE unit; or
 - » Using two properly sized scaled-down units.
- Expanding flow rate calculations and guidance in Informative Annex 7.

Next Steps and Implications

These new requirements were officially approved through a consensus ballot process by the NSF Joint Committee on April 18, 2022. The new requirements must now be approved by the NSF Council of Public Health Consultants (CPHC), an oversight body convened by NSF to ensure that all standards adopted through NSF Joint Committees are firmly grounded in protection of public health. Once the CPHC approves the new requirements, they will be officially adopted into NSF/ANSI 53.

The expected outcome is that these new requirements will reduce the cost and time to test POE systems for reduction of health effects from chemical contaminants, providing additional value to manufacturers, regulators, and end users addressing contamination situations. This value is expected to be significant regarding contaminants that may have toxicological exposure routes in addition to ingestion, such as dermal and inhalation, where POE solutions can address these multiple exposure routes and provide optimal overall protection. **WCP**

References

1. https://www.waterboards.ca.gov/gama/docs/coc_tcp123.pdf
2. https://www.epa.gov/sites/default/files/2014-03/documents/ffrrofactsheet_contaminant_tcp_january2014_final.pdf

About the author

♦ Rick Andrew is NSF's Director of Global Business Development – Water Systems. Previously, he served as General Manager of NSF's Drinking Water Treatment Units (POU/POE), ERS (Protocols), and Bio-safety Cabinetry Programs. Andrew has a bachelor's degree in chemistry and an MBA from the University of Michigan. He can be reached at 1-800-NSF-MARK or Andrew@nsf.org



INTRODUCING

Charger's Solution to

Connected Water Treatment

A FEW OF THE MANY BENEFITS:

- Access to real-time data on the performance of your water treatment systems.
- Manage the maintenance needs of several locations from one device using our convenient service reminders.
- Set up your daily service schedule using the data from one source as your guide.
- Save travel time between locations, knowing at a glance, when salt replenishment is needed.
- Retrofit to your existing products, where applicable.

For more information, call your nearest branch:

Elgin, IL	847-468-0098	Fort Myers, FL	239-390-5330	Phoenix, AZ	623-388-4837
Pottstown, PA	484-624-4859	Jacksonville, FL	904-374-5725	Reno, NV	775-828-9901
Bedford, NH	603-935-9107	Odessa, FL	727-376-9200	Katy, TX	346-704-2239
Poland, OH	330-531-8570	Palm City, FL	866-917-7638	Fort Worth, TX	817-626-5992
Danville, VA	434-205-3463			San Antonio, TX	210-681-6316

chargerwater.com

Fixing What Water Broke



Benjamin Franklin Plumbing Tampa
5808 N 56th St, Suite A
Tampa, FL 33610
(813) 536- 4515
<https://www.benjaminfranklinplumbing.com/tampa>
10 Technicians, 2 Apprentices, Install team of 5

Benjamin Franklin Plumbing Tampa was founded by former owner Scott Vigue in 2006 after operating for 17 years as “The Prince of Plumbing.” Benjamin Franklin serves most of west-central Florida including Hillsborough, Pinellas, Pasco, and Polk counties and specializes in residential plumbing services. While the company proudly offers Honest Water filtration products, it also has its own line of softeners in order to fit anyone’s water treatment needs and desires. Benjamin Franklin is known to solve just about any issue thrown its way, with a drain team that is proficient in cabling, descaling, and jetting residential drain systems, plus a full line of Rheem and Noritz water heaters.

Operations Manager James Mullis has been with the company for 11 years and has nothing but praise for his team. He prides Benjamin Franklin on stressing the importance of educating customers. Employees are continuously trained on water treatment and the best offerings. “For us, it is just our culture that technicians are a part of from day one,” Mullis said. “We are almost a water treatment company that does plumbing, it’s truly that important to us. It is engrained into our belief system.”

“I chose Benjamin Franklin because they were always the standard in the area. They would wear floor savers, so other companies started wearing them. They were parking a certain way in the roads, so guess what? Everybody else started doing that. They were always the standard or the leader,” Mullis said. “I respected them and what they had always done, and I wanted to have more opportunities to manage and grow within the company.”



Mullis has strong roots in plumbing; you might even say it was his destiny. His father and grandfather were both plumbers, so he was raised with its influence his whole life. Naturally, he decided at a young age that there was “no way in hell” he would follow the same path. Mullis graduated from college with a bachelor’s degree in communications and a passion for sports broadcasting, but when that dream job never presented itself, he went to work for his father’s plumbing business. Upon meeting his now-wife of 15 years, Mullis decided it was time to branch out from the position he held at his father’s company and look for something bigger in plumbing. He began working at a different plumbing company where he made good money, enough to start warming up to the idea of plumbing being passed down yet another generation. Mullis left that company and started working for a small plumbing business where he comfortably stayed for 6 years.



Though he didn’t plan for it to be this way, plumbing became easy for Mullis to keep falling into, especially when there was good money to be made and he was being treated so well. Throughout Mullis’s career, Benjamin Franklin was a common name in plumbing. They were a larger company with more management opportunities, and he wanted in. “I chose Benjamin Franklin because they were always the standard in the area. They would wear floor savers, so other companies started wearing them. They were parking a certain way in the roads, so guess what? Everybody else started doing that. They were always the standard or the leader,” Mullis said. “I respected them and what they had always done, and I wanted to have more opportunities to manage and grow within the company.”

When Mullis joined Benjamin Franklin in 2011, they were a company that offered water treatment. “I quickly learned that ‘the water broke it’ and started to learn more and sell,” he said. In his first five years, Mullis was a plumber in the field and became a field supervisor. In the last six years, he became the company’s operations manager and continues to hold that title today.

Mullis believes that with proper training, the plumbing industry should be leading the water treatment industry. “We are invited into people’s homes every day to fix problems. Why in the world would we not take that opportunity to talk to them about water treatment, which is ultimately what broke it?” he said. Mullis said he wants all the plumbers at Benjamin Franklin to have water treatment at the forefront of their minds, especially when “80 percent” of the problems they encounter have to do with it.



“A customer calls because they have a toilet running, but it wasn’t the toilet that was the problem, it was the water quality that made the toilet go bad and so calcium built up in the water drain,” he said. Benjamin Franklin also commonly encounters hard water and chloramine issues where they are located in Tampa, FL.

The company is branded by its dedication to giving the ultimate solution, thanks to the expertise and experience of its plumbers. Taking the time to understand a problem deeply and finding the absolute best way to fix it is the core principle of Benjamin Franklin. “What we do is strive to explain what water broke, what we are here to fix, and the safety of having filtered water in today’s world,” Mullis said. He admits that it can be difficult at times to educate customers on the true importance of water treatment, especially when they are not calling for water treatment specifically.

Taking the time to understand a problem deeply and finding the absolute best way to fix it is the core principle of Benjamin Franklin. “What we do is strive to explain what water broke, what we are here to fix, and the safety of having filtered water in today’s world,” Mullis said. He admits that it can be difficult at times to educate customers on the true importance of water treatment, especially when they are not calling for water treatment specifically.

Dealer Profile

By Emma H. Peterson

Benjamin Franklin has been pleased to offer Honest Water filtration products when dealing with a “water broke it” situation. “We believe, with the certifications Honest Water has, these are the best products in the industry. It is also quite versatile and allows us to be able to meet most customer’s needs financially and performance wise,” Mullis said. “For those customers that want soft water, we do offer a softener that pairs quite nicely with the Honest Water system.” The company offers Honest Water filtration both with and without the polyphosphate hard water solution.

Mullis finds that the biggest challenge the company faces is hiring qualified technicians. Benjamin Franklin has shifted its focus to having a strong apprentice program and growing its own people. Above all, the company is on the lookout for great people that are willing to work hard to be successful. “With it being so hard to find technicians, we also make sure we focus on quality over quantity. It’s not about running a lot of calls, it’s all about giving great customer service and running every call to the best of your ability,” he said.

As far as future endeavors, Benjamin Franklin is determined on reaching more customers and providing them with that consistently amazing experience that comes with the highest standards of quality. “With our newest ownership group and future expansion plans, more customers will be able to experience the same benefits that our Tampa customers do,” Mullis said. “Sure, we want to add the very best people we can find, but at the end of the day, we want to continue to perfect what we do and gain more customers through giving amazing service.” **WC&P**

About the author

◆ Emma H. Peterson, author of WC&P International's corporate and dealer profile series, is a student at the University of Arizona, majoring in journalism, with a minor in natural resources. Throughout her college experience, she has developed a following for her photography and photojournalism endeavors. After graduation, Peterson intends to broadly expand her creative/feature writing and photography prospects, as well as pursue her personal interests in skiing and rock climbing.



"WE LITERALLY HAD RUNNING WATER WITHIN 30 DAYS OF OUR INITIAL PHONE CALL. THIS OPPORTUNITY WE WERE BLESSED WITH IS NOTHING SHY OF A MIRACLE."
- FLIPPIN, AR

We're helping drill new wells for rural homeowners without access to a public water supply. Visit waterwelltrust.org for info.

 waterwell trust

WC&P

... The Water Source ...

Our bi-weekly email newsletter fills in the gaps between print issues.

Reaching more than 17,000 people, *The Water Source* is the perfect place for news, conference updates, product announcements, videos and more.

Contact Advertising:
(703) 822-3212 • ads@wcponline.com



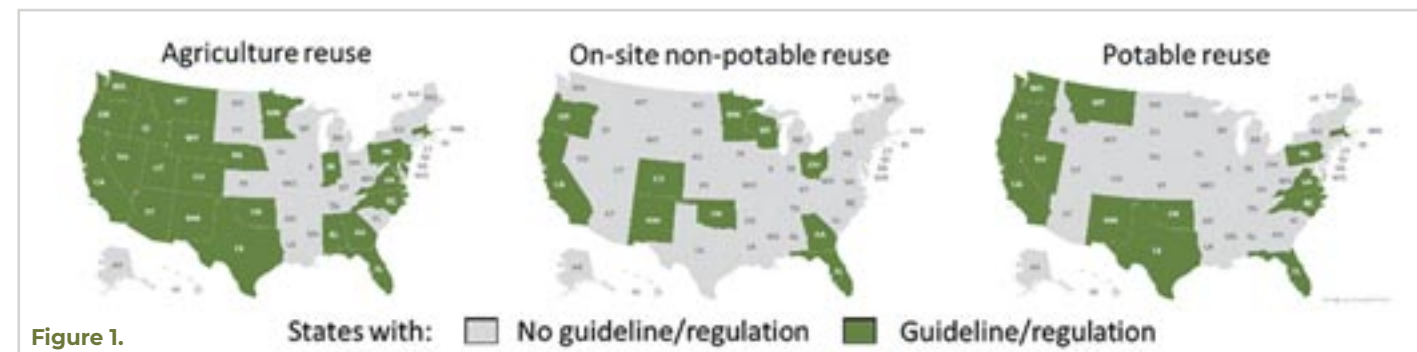
The Important Role of Virus Mitigation in Water Reuse

Over the past several decades, water reuse has expanded dramatically, driven by three main pressures: 1) addressing urbanization and water supply scarcity, 2) achieving efficient resource use (i.e., efficiently managing the water-energy-nutrient nexus), and 3) environmental and public health protection.¹ Given the confluence of these factors, reuse is expected to continue to increase from current levels of approximately 7% reuse² to upwards of 37% reuse in the US.^{1,3}

Highlighting the increasing urgency of water reuse, in 2021 the US Bureau of Reclamation declared the first-ever official water shortage on the Colorado River, which supplies water to 35 million people.¹ This triggered mandatory cuts in water delivery for areas of the Southwest, with approximately 18% reduction of Arizona's annual apportionment, 7% of Nevada's, and 5% of Mexico's.⁴ The associated drought contingency plans include water source diversification (e.g., water reuse), conservation efforts, underground water storage, and reductions in agriculture irrigation.⁴ Accordingly, the need for improved understanding of water reuse strategies and performance metrics is increasingly critical.

There are no federal regulations for water reuse in the US. Instead, states maintain primacy in developing water resources, and some states have programs addressing water reuse.¹ As of 2012, 30 states and one US territory had adopted regulations and 15 states had established guidelines or design standards governing water reuse (Figure 1).¹ In states or nations without established standards, EPA's 2012 *Guidelines for Water Reuse*¹ can assist in developing integrated water management planning and programs.

Figure 1. US states with regulations or guidelines for water reuse for different end uses, including agriculture, onsite non-potable (e.g., landscaping), and potable water reuse. This figure was modified from EPA's website, with data current as of October 2021.⁵



As indicated in Figure 1, reclaimed water can be used for different purposes, ranging from groundwater recharge to agricultural irrigation to potable reuse. Potable reuse can be further classified as shown in Figure 2. This “fit for purpose” framework facilitates design and operation of cost-effective treatment meeting the quality proscribed by its intended use.¹ Accordingly, “a portfolio of treatment options, including engineered and managed natural treatment processes, exists to mitigate microbial and chemical contaminants in reclaimed water, facilitating a multitude of process combinations that can be tailored to meet specific water quality objectives.”³ This is broadly illustrated in Figure 3, where water reuse may be appropriate for varying end users after secondary, tertiary, or more advanced wastewater treatment processes.

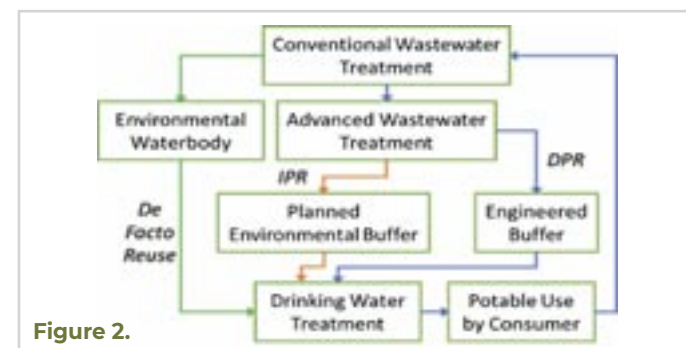


Figure 2. Potable water reuse pathways, including **de facto reuse** (drinking water intake located downstream of a wastewater discharge), **indirect potable reuse** (IPR; treated wastewater is used to augment drinking water supplies after passing through an environmental buffer), and **direct potable reuse** (DPR; treated wastewater is routed into a drinking water treatment plant after advanced wastewater treatment with or without retention in an engineered storage buffer).¹ The flowchart was adapted from Chaudhry et al. (2017).⁶

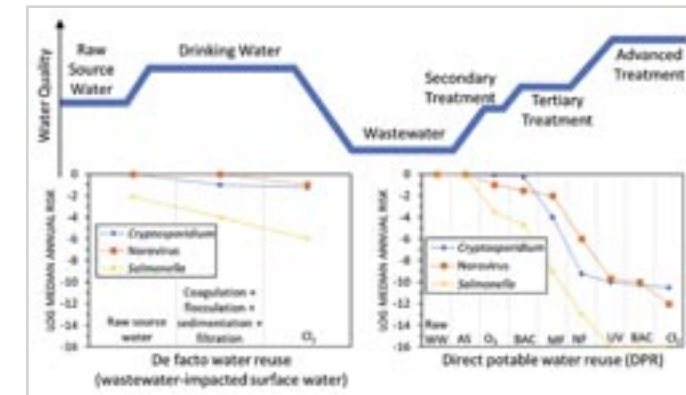


Figure 3. Water and wastewater treatment processes offer a broad spectrum of effluent water quality. Selection of an appropriate treatment train depends on the purpose of the reclaimed water, where fit-for-purpose design can better account for economic efficiency and environmental sustainability.¹ The bottom panels indicate modeled median annual risk (on a logarithmic scale, where, e.g., -4 = 1 in 10,000 risk of infection) from *Cryptosporidium* (a representative protozoan parasite), norovirus (a representative enteric virus, assessed as discrete virions), and *Salmonella* (a representative bacteria) in example de facto water reuse and DPR treatment trains. This figure was adapted from EPA (2012)¹ and estimates of risks reported by Chaudhry et al. (2017).⁶

Regardless of the reclaimed water's end use, pathogen mitigation is the most critical treatment objective.¹ Waterborne pathogens can include helminths, protozoa, bacteria, and viruses. As living microorganisms, the risks these pathogens pose to human health differ fundamentally from chemical toxins. Microorganisms can occur in high numbers in feces and may be difficult to treat.⁷ In particular, enteric viruses (more than 200 of which may occur in wastewater, representing the greatest diversity of species relative to other pathogens)^{8,9} generally occur in much greater concentrations and exhibit elevated infectivity compared to other pathogens. Thus, they are the most likely pathogens to be spread through water reuse, thereby posing the greatest risk.^{7,8}

In water reuse, as in all forms of water treatment, the objective is to reduce human health risks to very low levels, most often by reducing the probability of yearly infections to less than 1 in 10,000 or less than 1 in 1,000,000, as completely eliminating risk is untenable. Figure 3 illustrates the risks associated with several important waterborne pathogens after different stages of de facto reuse or DPR, where risks decrease as more advanced treatment is implemented. Using quantitative microbial risk assessment (QMRA), Chaudhry et al. (2017)⁶ found that the yearly 1 in 10,000 (10^{-4} , or -4 reported on a log scale) risk of infection threshold was exceeded for norovirus and *Cryptosporidium* in the de facto reuse scenario (even with a small degree of wastewater impact on the source water), whereas the four different DPR configurations tested reduced risk to within acceptable levels.

Estimates of risks after treatment rely on accurate quantification of viral loads in the wastewater initially. A review of virus levels in untreated wastewater showed concentrations ranging from 158,000 to 9.8 billion per liter (assessed using molecular techniques).⁹ This wide variability reflects differences due to types of virus, protocols used, testing location, and timing with respect to the number of infected individuals shedding viruses at any given time.

Unfortunately, it is impractical to monitor for every individual virus in wastewater; thus, indicator microorganisms are commonly used as signs of the presence of human enteric viruses (similarly, surrogate microorganisms are commonly used in process challenge testing as models of viral pathogen treatability). Among others, pepper mild mottle virus, crAssphage, and human polyomavirus have been suggested as indicator viruses; however, little is known about their removal through wastewater treatment processes.¹¹

Unfortunately, it is impractical to monitor for every individual virus in wastewater; thus, indicator microorganisms are commonly used as signs of the presence of human enteric viruses (similarly, surrogate microorganisms are commonly used in process challenge testing as models of viral pathogen treatability). Among others, pepper mild mottle virus, crAssphage, and human polyomavirus have been suggested as indicator viruses; however, little is known about their removal through wastewater treatment processes.¹¹ Greater understanding of indicator fate during treatment, particularly compared to pathogenic viruses, is needed as susceptibility to treatment processes varies by type of virus, water quality, operational parameters, etc. For example, adenovirus is more resistant to UV light compared to other viruses, while reovirus is more resistant to chlorination.⁸

Based on best available data at the time, the treatment targets for IPR in California and DPR in Texas currently specify 12-log (99.9999999999%) reduction of enteric viruses.^{1,10} When using reclaimed water to irrigate edible crops, a 6-log reduction of viruses has been suggested.⁹ As of 2012, epidemiological studies of reuse did not identify any patterns relating adverse health effects with water reuse projects in the US.³ However, given that concentrations of viruses in wastewater may exceed estimates used for these risk-based water reuse guidelines, Gerba et al. (2017)⁹ suggested that 2–3 logs of additional reduction beyond current recommendations may be prudent to ensure safe use of reclaimed water.

As water reuse is increasingly implemented, quantitative reliability analyses are essential, and should incorporate not only variability in virus loading, but also expected variability of effluent quality, mechanical reliability, and the consequences of mechanical failure.¹² Attention should also be given to scaling water reuse to effectively serve a range of applications. For example, Fane et al. (2002)⁷ demonstrated a diseconomy of scale wherein the risks of waterborne infections, particularly related to waterborne enteric viruses, increased with increasing population served by water reuse systems. This finding suggested that decentralized urban water reuse, which has historically received less attention compared to centralized systems, may play an important role in water reuse portfolios in the future.⁷ Regardless of the installation's scale, the success of potable reuse in any configuration ultimately depends on reliable pathogen removal.⁶ **WCP**

References

1. USEPA. 2012 Guidelines for Water Reuse.; 2012.

2. Rauch-Williams T, Marshall M, Davis D. Baseline data to establish the current amount of resource recovery from WRRFs. In: *Water Environment Federation*. ; 2018:Available at: <https://www.wef.org/globalassets/as>.

3. National Research Council. *Water Reuse: Potential for Expanding the Nation's Water Supply through Reuse of Municipal Wastewater*. National Academies Press; 2012. doi:10.17226/13303

4. USBR. Reclamation announces 2022 operating conditions for Lake Powell and Lake Mead. <https://www.usbr.gov/newsroom/#/news-release/3950>

5. EPA. Maps of States with Water Reuse Regulations or Guidelines. Published 2022. Accessed April 25, 2022. <https://www.epa.gov/waterreuse/maps-states-water-reuse-regulations-or-guidelines>

6. Chaudhry RM, Hamilton KA, Haas CN, Nelson KL. Drivers of microbial risk for direct potable reuse and de facto reuse treatment schemes: The impacts of source water quality and blending. *Int J Environ Res Public Health*. 2017;14(6):1-20. doi:10.3390/ijerph14060635

7. Fane SA, Ashbolt NJ, White SB. Decentralised urban water reuse: The implications of system scale for cost and pathogen risk. *Water Sci Technol*. 2002;46(6-7):281-288. doi:10.2166/wst.2002.0690

8. Gerba CP, Betancourt WQ, Kitajima M, Rock CM. Reducing uncertainty in estimating virus reduction by advanced water treatment processes. *Water Res*. 2018;133:282-288. doi:10.1016/j.watres.2018.01.044

9. Gerba CP, Betancourt WQ, Kitajima M. How much reduction of virus is needed for recycled water: A continuous changing need for assessment? *Water Res*. 2017;108:25-31. doi:10.1016/j.watres.2016.11.020

10. California State Water Resources Control Board. California Title 22. Published online 2018:1-99. [https://govt.westlaw.com/calregs/Document/IF0BB2B50D4B911DE8879F88E8B0DAAAE?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=\(sc.Default\)](https://govt.westlaw.com/calregs/Document/IF0BB2B50D4B911DE8879F88E8B0DAAAE?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default))

11. Ahmed W, Kitajima M, Tandukar S, Haramoto E. Recycled water safety: Current status of traditional and emerging viral indicators. *Curr Opin Environ Sci Heal*. 2020;16:62-72. doi:10.1016/j.coesh.2020.02.009

12. Eisenberg D, Soller J, Sakaji R, Olivier A. A methodology to evaluate water and wastewater treatment plant reliability. *Water Sci Technol*. 2001;43(10):91-99. doi:10.2166/wst.2001.0589

About the author

Dr. Brooke K. Mayer is an Associate Professor in the Department of Civil, Construction and Environmental Engineering as part of the Opus College of Engineering at Marquette University. She holds Bachelors, Masters and Doctorate degrees in civil engineering with an emphasis in environmental engineering from Arizona State University. She is a registered Professional Engineer in the state of Arizona.



WCP & STRAIGHT FROM THE TAP

Hear from real people in the water treatment industry in our new podcast.

Listen on:

- wcponline.com/podcasts
- Apple Podcasts
- Google Podcasts
- Spotify
- wherever you find your favorite podcasts.

49th Annual CONVENTION

www.twqa.org

TROPICAL WATERS

TEXAS WATER QUALITY ASSOCIATION
TWQA

49TH ANNUAL CONVENTION

**EMBASSY SUITES
DALLAS-FRISCO HOTEL/
CONVENTION CENTER**
7600 JOHN Q HAMMONS DR.
FRISCO, TEXAS 75034

For Hotel Room Reservations
call 1-972-712-7200
(reference Texas Water
Quality Association)

Or register online at
<https://bit.ly/3lxEOpp>

Room Rate \$155.00 per night
(parking \$5.00 per night) -
based on availability in room block
before JULY 1, 2022.

(After July 1, 2022, room and rates are
based on hotel availability.)

**WE HOPE TO
SEE YOU THERE!**



**SCHEDULE
OF EVENTS**
...
JULY 25 - 28, 2022

Monday, July 25, 2022

- Basic & Advanced Math
- Board of Directors Meeting
- President's Welcome Reception

Tuesday, July 26, 2022

- Golf Tournament
- Basic Water Conditioning
- Business & Technical Session
- Dealers Roundtable
- Awards Banquet (Luau)

Wednesday, July 27, 2022

- Annual Meeting/General Session
- Business & Technical Sessions
- EXHIBITION 11:00 A.M - 4:00 P.M.
(lunch included)
- FIELD OF DREAMS EVENT

Thursday, July 28, 2022

- Advanced Water Conditioning
- TCEQ Exams (requested)
- Business & Technical Sessions

What's New

Plug and Play Water Filtration from Hungerford & Terry



The Plug and Play Water Filtration Systems from **Hungerford & Terry** are designed to handle flows from 14 to 1808 gpm, and are available with one to three tanks in diameters from 36" to 120" in 6" increments. The system comes complete with piping, valves, actuators, instruments, and controls all of which are mounted on a rugged, durable, skid-mounted frame. To use this system, simply set it in place wherever filtration is needed, hook up the water and electrical connections, load and condition media, and the system will be operational for the removal of iron, manganese, hydrogen sulfide, arsenic, and radium.

<https://www.hungerfordterry.com/treatment/plug-and-play/>

The Barrel by Veolia Water Technologies



Veolia Water Technologies, a subsidiary of the Veolia Group, has launched the Barrel in Asia-Pacific. The Barrel is a multi-RO element vessel that is designed to be a plug-and-play system;

the vessel is manufactured off-site and delivered as a single unit so that installation on-site can be fast-tracked and project schedules shortened. The modular design of the Barrel makes it highly scalable, offering varying capacities from 400 m3/day to 50,000 m3/day per unit and it can be used in place of existing RO membranes and nano filtration skids for a more economically viable alternative. The Barrel is compact and suitable for outdoor installations which offers a footprint reduction of up to 25%. This sustainable solution also provides reduction in electrical consumption in the range of 0.05 kWh/m3 of fresh water produced.

The unique design of the Barrel also reduces the number of high-pressure piping connections to just two, the seawater inlet and the brine outlet. This design feature makes it safer for operators and minimizes on-site risks during maintenance and operation phases. The Barrel includes a built-in digitalization system complete with smart connectors that provide real-time status updates on each membrane's condition. Their performance can be monitored automatically and accessed remotely, helping operators make better decisions on whether to shut down, rotate, or replace membranes.

<https://www.veoliawatertechnologies.com/asia/en>

New Flomatic Valve 8-inch AIS compliant Model 408S6 Stainless Steel Ball Check Valve



Flomatic Valves introduces the new 8-inch AIS compliant Model 408S6 Stainless Steel Ball Check Valve. Flomatic's ball check valves are anti-roping and self-cleaning; they have no sharp edges or snag points, which helps to prevent clogging from non-flushable wipes and other non-degradable sanitary products.

This new design is virtually maintenance free with features including a clean-out cover, a Nitrile (Bruna-N) covered metal sinking ball, and corrosion-resistant stainless-steel fasteners. The Model 408S6 ball check valve includes heavy duty bosses to accommodate NPT tappings for additional optional components. The Model 408S6 contains no moving parts except for the Bruna-N vulcanized metal ball which will move out of the flow path which results in reduced head loss and longer service life.

<https://www.flomatic.com/news/flomatic-introduces-8-inch-ais-compliant-model-408s6-stainless-steel-ball-check-valve/>

Fight Irrigation Pipe Corrosion with Biobased EcoLine® AL-Corr™



The answer to pipe corrosion in irrigation equipment comes in the form of Cortec's **EcoLine® AL-Corr™**, a biobased corrosion inhibitor that will help to extend the service life of aluminum irrigation pipes.

EcoLine® AL-Corr™ is specifically designed to protect aluminum irrigation pipes during operation or intermittent use. It proves to be especially important during the times when irrigation pipes are sitting idle with residual moisture and plenty of air to feed the oxidation process. EcoLine® AL-Corr™ is effective at low dosages and should be added to irrigation water at a rate of 250-50 ppm.

EcoLine® AL-Corr™ contains 18% USDA certified biobased content, qualifying it as a product that falls under the mandatory federal purchasing initiative of the USDA BioPreferred Program. Cortec chose to use biodegradable ingredients in EcoLine® AL-Corr™; the ingredients used were approved for use in personal care products and food preservation. EcoLine® AL-Corr™ does not contain phosphates or nitrites, helping to reduce nutrient pollution in farm water runoff.

<https://www.cortecvci.com/press-release-cortecs-biobased-ecoline-al-corr-üghts-irrigation-pipe-corrosion/>

Endress+Hauser Broadens its Mobile Calibration Services



Endress+Hauser extends on-site calibration offerings by adding three mobile calibration rigs to the existing fleet; this has resulted in a total of 19 calibration rigs that service Endress+Hauser. All Endress+Hauser authorized sales and service representatives across the United States have mobile calibration capabilities and more than 60 trained and certified calibration technicians.

Endress+Hauser offers services that are ISO 17025 accredited, ensuring both quality and efficiency when calibrating instruments. Their on-site services provide end users and customers a direct connection with technicians, which works to mitigate confusion and downtime. The calibration rigs also work to eliminate the need to send in instrumentation resulting in faster turnaround times.

<https://www.us.endress.com/en/media-center/news-and-press-releases/mobile-calibration-rig>

Charger Total Connect App



Introducing **Charger Water's** solution to connected water treatment, the Charger Total Connect app offers access to real-time data on a water treatment system's performance. The app will also allow you to manage the maintenance needs of several locations from a singular device and will set up your daily service schedule using data from one source as the guide. Using this app will save on travel time between locations and will retrofit your existing products where applicable.

Chargerwater.com. **WCP**

To submit a product announcement, email the information and a high-resolution photo to info@wcponline.com.

Cartwright Consulting Co.
Consultants to the
Water & Wastewater Industry

Consulting Engineering in:
Water Purification
Wastewater Treatment
Drinking Water
Medical / Pharmaceutical
Chemical / Food Processing
Ultrapure Water Design
Microbiological Control / Reduction
Separation Processes
Membrane Technologies
Ozonation / Ultraviolet Irradiation

Providing:
Technical Consulting
Engineering Design
Application / Performance Testing
Educational Services / Training
Market Analysis / Studies
Operator Training
Research & Development

Cartwright Consulting Co.
Peter S. Cartwright, P.E.
952-854-4911 Tel 952-854-6964 Fax
peterscartwright@gmail.com
WWW.CARTWRIGHT-CONSULTING.COM

PURE AQUA, INC.
Your #1 Source for Membrane Elements
Residential, Commercial & Industrial

Dow **HYDRANAUTICS**

'TORAY'

Tel (714) 432-9996 | sales@pureaqua.com
www.pureaqua.com

MICRON
Filter Cartridge Corp.

www.micronfiltercartridges.com
630-337-3877
506 Spring Rd.
Evanston, IL 60126

MADE IN THE USA

- generic and private labeling available
- drop ship directly to your customer
- short lead times
- highest quality standards
- best customer service

Email: micron506@msn.com

PURE AQUA, INC.
Global Leader in Water Filtration Systems
Commercial & Industrial

Tel (714) 432-9996 | sales@pureaqua.com
www.pureaqua.com

» 20 years experience in translation of technical and marketing materials
» Large, established client list
» Knowledge of cultural business practices
» Over 10 years providing translation service to Agua Latinoamérica
» English ↔ Spanish Translation Services

The Key to Success in Latin America is Successful Communication.

Gerardo Monroy
520-955-2963
gmonroy61@yahoo.com
monroymoor@comcast.net

PURE AQUA, INC.
Global Leader in Reverse Osmosis Systems
Commercial & Industrial

Tel (714) 432-9996 | sales@pureaqua.com
www.pureaqua.com

MicroVantage
Ultra Premium Filter Series

LET'S BE CLEAR
THE ANSWER IS MICROVANTAGE

When high purity & absolute retention are prerequisites for your filtration process, MicroVantage cartridges deliver.

- » Membrane Cartridges
- » Multi-Blown Depth Cartridges
- » Pleated Filter Cartridges
- » Custom options available
- » Made in USA

SHELCO.COM
100 Bradley Street, Middletown, CT
info@shelco.com • 1.800.543.5843
ISO 9001:2015

MARLO INCORPORATED

PACKAGED PORTABLE DEIONIZATION EXCHANGE REGENERATION PLANTS

SIZES AVAILABLE
• 40 ft.³
• 60 ft.³
• 100 ft.³
• 200 ft.³

262.681.1300 • info@marlo-inc.com
www.marlo-inc.com

CHEMICAL FREE WATER TREATMENT

The Ozone System For Well Water And RO Water Holding Tanks

IRON-MANGANESE-H₂S ALGAE-BACTERIA*

- Easily solve these common water problems.
- Continuously ozonates, filters and circulates tank water.
- Reliable - Simple - Low Maintenance. The most cost effective way to treat problem water.
- No water pumps or guesswork. Installs in under 2 Hours.
- 100% Chemical Free. Adds nothing but oxygen to the water.
- R.O. Water Tank Systems also available.

All domestic and international Voltages/Hertz available.
*Limits Apply - Please Contact Us for More Information.

Triple O Systems, Inc.
(408)378-3002/Fax: (408)378-7155
Website: www.TripleO.com
E-Mail: Sales@TripleO.com

MOVING?

Send us your new mailing address so that your subscription is not interrupted by your relocation.

Contact the Circulation Department

info@wcponline.com

WCP

Thomas Products Ltd.
Flow & Level Sensors
Industrial Sensors & Controls

Model 1101 **Model 2651**

Chemical Feed Pump Controls
Feed Pump Controls Activate and Deactivate Pumps When Calibrated Flow Set Point is Reached!

www.ThomasProd.com **1-800-666-9101**
Flow & Level Sensors

Classifieds

Classified rates are \$1.95/word; \$78 minimum. Classified display ads billed at \$80/column inch. Additional \$20 for web-page advertising for one month. Add \$5 for blind-box number; inquiries to be forwarded by the publisher. Deadline: first week of the month preceding publication. Contact the Circulation Department at ads@wcponline.com or (703) 822-3212.

EMPLOYMENT

CULLIGAN WATER

Culligan water of Bozeman, MT is seeking to fill the following positions. This 40-year family business is in the fastest growing markets in the US. We serve the entire SW Montana with 20 employees.

GENERAL MANAGER

This position would consist of sales and over seeing day in and day out operations. This opportunity has the potential of a six figure income, plus our benefits package.

INSTALLERS AND SERVICE TECHNICIANS
These positions are needed for the future growth SW Montana. Income is DOE. \$25.00-\$40.00 per hour.

Please send resume to:
markh@culliganofbozeman.com

EMPLOYMENT

FRANKLIN WATER TREATMENT

***** Vice President *****
Business Development
Commercial Water Treatment

Franklin Water Treatment is growing, and we're looking for a great candidate for a new role – VP, Business Development for our Commercial Water Treatment business. This executive role will be responsible for overseeing the business development, sales, marketing, distribution, and service of Commercial Water Treatment product lines along with ensuring the long-term growth and profitability through a strong portfolio of products.

For a full job description of the position, including duties, skills, education and experience levels, please visit our website at franklin-electric.com/company/careers for more information and to apply.

FOR SALE

PREMIUM BRAND HIGH MARGIN SMALL PACK BOTTLING COMPANY

- Pacific NW Location
- Sale includes vehicles, bottling line equipment and inventory.
- Perfect situation for remote management.
- Customer base of large and stable distributors.

For more information:
971-645-9122

FOR SALE

5-GAL WATER BOTTLING PLANT FOR SALE

Start bottling immediately: 100 bph. Includes auto-bottling machine, UV, 2,500 gpd RO, pumps, manuals, video. \$24,500.00.

Call Bill @ (614) 843-8491.

FOR SALE



Dual 480 GPM Reverse Osmosis System

System originally installed at Boeing in 1997, operated for approximately 18 months and completely refurbished 2008-2009. System not used beyond periodic testing since refurbished. Like new condition.

240/480 GPM, 450 PSI Rating: Able To Purify Brackish Water, 310 Gallon Clean-in-Place (CIP) tank system w/controls, (3) Gould transfer & flush pumps, Flow Rate per System: 240 GPM (240 gal. in - 200 gal. out pure) Power: 480V - 60Hz - 3PH

Located in Auburn, WA. Owner will load buyers truck. \$110,000 / Offer

Contact: Rebecca @ (253) 777-9444
roundsra@gmail.com • cdproservices.com

WCP &..... Classifieds WORK!

Classified rates are \$1.95 per word with a \$78 minimum.

Classified display advertising is billed at \$80 per column inch.

An additional \$20 will put your classified ad on our web page for one month.

Add \$5 for a blind box number; inquiries will be forwarded by the publisher.

Place an ad today!

Contact the Circulation Department
ads@wcponline.com

WCP &

THE REVOLUTION PACKAGE
Extreme Iron or Manganese, we HAVE the solution

*Don't lose out to rural water,
Fix your customer's water with
The Sentry I Open-Air equipment.*

- Low Pressure Filtration
- Reduced Maintenance
- Increased Contact Time
- Proven Treatment on IRON from 5-30+ ppm!

BETTER WATER IND., INC.
209 N Tyler St, Tyler, MN 56178
www.BetterWaterInd.com
(507) 247-5929

Directory of Advertisers

(IFC = Inside Front Cover IBC = Inside Back Cover BC = Back Cover)

Aqua Systems	IFC	Hiniker	14	Shelco Filters	44
Better Water Industries, Inc.	46	Hydronix Water Technology	1	Smart Products	BC
Cartwright Consulting Co.	44	KDF Fluid Treatment, Inc.	18, 19	Thomas Products, Ltd	45
Charger Water Conditioning	33	LeverEdge (The)	15	Triple O Systems, Inc.	44
Clack Corporation	2	Marlo Inc.	44	TWQA	41
Enpress Composites LLC	31	Micron Filter Cartridge Corp.	44	Vertex Water Products	17
G. A. Murdock, Inc.	3	Myron L Company	48	Water Quality Association	10, 11
Gerardo Monroy Translations	45	Nelsen Corporation	6	Well Water Trust	23, 36
H2O Filter Warehouse	IBC	Omnipure Filter Company	7		
Hanskraft Runxin, LLC	5	Pure Aqua, Inc.	9, 44, 45		



Ultrameter II™
MODEL: 6PFC®

Conductivity
Resistivity
TDS
pH
ORP
Temperature
Free Chlorine Equivalent (FC®™)



Ultrameter III™
MODEL: 9PTKB

Conductivity
Resistivity
TDS
pH
ORP
Alkalinity Titration
Hardness Titration
LSI Calculator
Temperature
Free Chlorine Equivalent™



Since 1957
Accuracy
Reliability
Simplicity



www.myronl.com
760-436-2021





CBC05-10
(Primary CBC-10-5)
Carbon Block Cartridge

- 100% Premium Coconut Shell Carbon
- 5 Micron Nominal Filtration Rating
- Chlorine, Taste & Odor Reduction
- NSF Certified - Standard 42

The CBC series is tested and certified to NSF International under NSF/ANSI Standard 42 for material safety.

NSF

Caution

Use guide:

1. Flush for at least 5 minutes prior to use
2. Recommended for use on municipally safe water supplies
3. Best performance operating temp: 40-120° F / 4-50° C

Caware Water Filter Solutions

TOP QUALITY NSF

COCONUT SHELL CARBON BLOCK CARTRIDGES

IN 1, 5 & 10 MICRONS

10" & 20" Carbon Block Cartridges					
CBC01-10 10"x2½"	1µ	As Low As \$4.20	CBC01-20 20"x2½"	1µ	As Low As \$9.31
CBC05-10 10"x2½"	5µ	As Low As \$3.78	CBC05-20 20"x2½"	5µ	As Low As \$8.45
CBC10-10 10"x2½"	10µ	As Low As \$3.78	CBC10-20 20"x2½"	10µ	As Low As \$8.45

Full-Flow/BB Carbon Block Cartridges					
CBC05-B10 10"x4½"	5µ	As Low As \$12.45	CBC05-B20 20"x4½"	5µ	As Low As \$24.90
CBC10-B10 10"x4½"	10µ	As Low As \$12.45	CBC10-B20 20"x4½"	10µ	As Low As \$24.90



H2O
FILTER WAREHOUSE

www.h2ofilterwarehouse.com ♦ 770.874.2608 / 800.955.0556

Request a copy of our catalog online



NEW CATALOG

FEATURING FULL SPECIFICATIONS
FOR OUR CHECK AND PRESSURE
RELIEF VALVES, LIQUID AND AIR
PUMPS, AND RELATED COMPONENTS.
ALL PRODUCTS ARE MADE TO ORDER
AND IDEAL FOR LOW PRESSURE, LOW
FLOW APPLICATIONS.

DOWNLOAD PDF AT:

SMARTPRODUCTS.COM/DOCS/SMART_PRODUCTS_PRODUCT_CATALOG.PDF



**SERIES 3000
LIQUID PUMPS**
ENERGY EFFICIENT, DURABLE & DEPENDABLE

FEATURES

- High flow rates
- Low maintenance
- Long life expectancy
- Easy to install
- Wide range of materials
- Customizable options

OPTIONS BY MODEL

Model	Material	Flow Rate (GPM)	Pressure (PSI)	Max. Temp. (°F)
3000-1	Stainless Steel	10-20	150	150
3000-2	Aluminum	10-20	150	150
3000-3	Brass	10-20	150	150
3000-4	Carbon Steel	10-20	150	150



1.800.338.0404