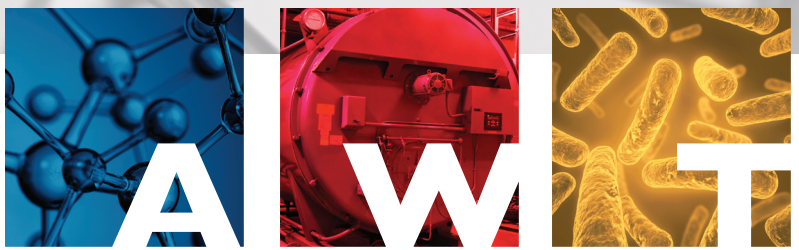
AWT
ASSOCIATION OF WATER TECHNOLOGIES



October 29 – November 1, 2014
Omni Fort Worth and Fort Worth Convention Center
Fort Worth, TX

2014 Annual Convention and Exposition

Everything's **Bigger** in Texas …
…Even AWT's Annual Convention and Exposition

AWT's Annual Convention and Exposition continues to grow each year—breaking previous registration records. We expect the same for the 2014 Annual Convention and Exposition being held in Fort Worth, Texas. Here's just a peek at what else is bigger at this year's convention:

More networking—More attendees means more networking opportunities. The convention is a perfect time to meet leading experts in the field and build long-term relationships.

More sessions—You'll walk away with even more tools and skills that can have an immediate effect on the future direction of your business—and impact your bottom line.

Bigger venue for the Annual Reception and Awards Dinner—This year's event will be held at AT&T Stadium, home of the Dallas Cowboys! You'll get to tour the stadium, walk the field, and celebrate the achievements of the recipients of the Ray Baum Memorial Water Technologist of the Year and Supplier of the Year Awards.

Bigger Exposition Hall—With more exhibitors than ever before, you will learn about the latest advances in the industry and see demonstrations of products and technologies that are changing the field of water treatment.

Events

Wednesday

Golf Tournament

6:00 am – 2:00 pm

It's time for your swing to shine at the Texas Star Golf Course. Course architect Keith Foster strived to use the land's natural terrain and features. Hurricane Creek slashes through the heavily wooded site, playing an integral part in several holes. The result is a uniquely challenging test of strategic golf on a natural course. And don't forget that the proceeds from all mulligans purchased will go to the Humane Society of North Texas: www.hsnt.org.

CWT and New Member Reception

7:00 pm – 8:00 pm

Two celebrations in one! AWT will be hosting a reception recognizing the significant accomplishments of those who have achieved the status of Certified Water Technologist (CWT), and also welcoming our new AWT members.

Thursday

Women of Water Reception

7:00 pm – 8:00 pm

Join the Women of Water (WOW) to hear from our special guest speaker, Fran Phillips, Environmental Partner at Gardere Wynne Sewell Law Firm. Fran will speak about her many inspirational stories that tell of how she overcame her obstacles as a young female attorney working for the Environmental Protection Agency. Fran has just been named the Top Environmental Attorney in Texas and one of the Top 100 Female Attorneys in the World.

Friday

Young Professionals Happy Hour

5:00 pm – 6:00 pm

The AWT Young Professionals Group was created to provide a place for young professionals within the water treatment industry to learn, mingle, and grow. Join us for Happy Hour to meet with your peers in the industry.

AWT Annual Reception and Awards Dinner

6:00 pm – 10:00 pm

We'll be visiting the famous AT&T Stadium for our Annual Reception and Awards Dinner this year! Not only will you get a tour of the stadium, but you'll also get to walk on the field. Plus, after dinner, we'll celebrate the achievements of the recipients of the Ray Baum Memorial Water Technologist of the Year and Supplier of the Year Awards. Remember to wear your favorite team jersey!

Learning Lounge

These sessions are designed to be an informal way for attendees to share their own experiences and ideas. Be sure to stop by!

Thursday

11:00 am–11:30 am	Breaking Bad…News
11:30 am–Noon	Generations in the Workforce
4:30 pm–5:00 pm	Accountability at Work: Bridging Expectations and Performance
5:00 pm–5:30 pm	Making Technology Work for You

Friday

1:00 pm–1:30 pm	Your Company's Online Presence
1:30 pm–2:00 pm	The Top 3 Challenges Facing Your Business

Executive Portrait Lounge

Need to update your picture for your website, business card, or other company marketing materials? Be sure to take advantage of having a professional head shot taken by the official convention photographer, Chuck Fazio Photography. Chuck Fazio Photography will be available Wednesday (5:00 pm – 7:00 pm) and Thursday and Friday during lunch (Noon – 2:00 pm) to take photos. Visit the Executive Portrait Lounge located in the exhibit hall.

Schedule-at-a-Glance

Exhibit Hall
General Session
Track I
Track II

Tuesday, October 28

10:00 am – 5:00 pm	**Registration Open**
10:00 am – 5:00 pm	Exhibitor Move-In

Wednesday, October 29

6:00 am – 2:00 pm	**AWT Golf Tournament** *Shuttle departs at 6:00 am from the hotel lobby.* *Tournament play begins at 8:00 am.*
8:00 am – 7:00 pm	**Registration Open**
8:00 am – 2:00 pm	Exhibitor Move-In
2:30 pm – 4:00 pm	**Technical Subcommittee Meetings** *Boiler Subcommittee* *Cooling Subcommittee* *Pretreatment Subcommittee* *Special Projects Subcommittee* *Wastewater Subcommittee*
4:00 pm – 4:30 pm	**Moderator Training** *Moderators and AWT board members required to attend.*
4:00 pm – 7:00 pm	**Opening Reception – Exhibit Hall Open**
7:00 pm – 8:00 pm	**CWT and New Member Reception** *(By Invitation Only)*

Thursday, October 30

7:00 am – 7:00 pm	**Registration Open**	
7:00 am – 8:30 am	**Continental Breakfast**	
7:30 am – 7:50 am	**Commercial Corner** *BWA Water Additives*	**Commercial Corner** *Silver Bullet Water Treatment Company*
8:00 am – 8:20 am	**Commercial Corner** *Walchem, IWAKI America Inc.*	**Commercial Corner** *LuminUltra Technologies Ltd.*
8:00 am – 5:00 pm	Speaker Ready Room Open	
8:30 am – 10:00 am	**GENERAL SESSION – Annual Membership Town Hall Meeting** ▪ Call to Order ▪ President's Report ▪ New Business: Panel Discussion on AWT Membership Cap ▪ Q&A Period – Treasurer's Report ▪ Q&A Period – Committee Reports ▪ Q&A Period – Liaison Reports ▪ Approval of Minutes from October 31, 2013 ▪ Adjournment	
10:00 am –11:00 am	**KEYNOTE SESSION – Never Give Up On a Dream** Jim "The Rookie" Morris	
11:00 am – 2:00 pm	**Exhibit Hall Open** *(Complimentary Lunch)*	
11:00 am – Noon	**Learning Lounge Open** Facilitator: R. Trace Blackmore, CWT, LEED AP 11:00 am – 11:30 am – Breaking Bad…News 11:30 am – Noon – Generations in the Workforce	
12:30 pm – 2:00 pm	**Past Presidents Luncheon**	
2:00 pm – 4:00 pm	**Exhibit Hall Open** *(By Appointment Only)*	
2:00 pm – 4:00 pm	**Track I** Moderator: Earl Martens	**Track II** Moderator: Peter Greenlimb, Ph.D., CWT
	2:00 pm – 2:30 pm **Sustainability Through Increased Chiller Efficiency by Biofilm Removal and Prevention** Lex LaMotte *Zentox Corporation*	2:00 pm – 2:30 pm **Ground Up: Designing a New Polymer for Independent Water Treatment Companies** Mike Standish *Radical Polymers*
	2:30 pm – 3:00 pm **Biofilm Remediation Through the Use of Non-Oxidizing Biocides and Biofilm Release Agents** Michael Coughlin *Weas Engineering, Inc.*	2:30 pm – 3:00 pm **The Development of a Novel Antiscalant Polymer to Control the Formation of Silicate Scale** Angel Padilla *Dow Microbial Control*
	3:00 pm – 3:30 pm **Scale Formation: Biology, Boundary Dynamics, LSI and Sphagnum Moss** David R. Knighton, MD *Creative Water Solutions LLC*	3:00 pm – 3:30 pm **Deposit Control Polymer Selection Criteria for High-Temperature Applications** Zahid Amjad, Ph.D. *The Lubrizol Corporation*
	3:30 pm – 4:00 pm **Understanding Amperometric Chlorine Measurements** John Clark *Chemtrac, Inc.*	3:30 pm – 4:00 pm **pH Impact on Inhibitor Performance** Robert J. Ferguson *French Creek Software, Inc.*
4:00 pm – 7:00 pm	**Exhibit Hall Open** *(Complimentary Reception)*	
4:30 pm – 5:30 pm	**Learning Lounge Open** Moderator: Bernadette Combs, CWT, LEED AP 4:30 pm – 5:00 pm—Accountability at Work: Bridging Expectations and Performance 5:00 pm – 5:30 pm—Making Technology Work for You	
7:00 pm – 8:00 pm	**Women of Water (WOW) Reception** Guest Speaker: Fran Phillips *Environmental Partner, Gardere Wynne Sewell Law Firm*	

Schedule-at-a-Glance

Friday, October 31

7:00 am – 9:00 am	**Continental Breakfast**	
7:30 am – 8:45 am	**Committee Breakfast Meetings** ▪ Business Resources Committee ▪ Certification Committee ▪ Convention Committee ▪ Education Committee ▪ Legislative/Regulatory Committee	▪ Marketing/Communications Committee ▪ Membership Committee ▪ Technical Committee ▪ Standards Task Force
7:00 am – 5:00 pm	**Registration Open**	
7:00 am – 5:00 pm	Speaker Ready Room Open	
8:00 am – 8:20 am	**Commercial Corner** *AMSA, Inc.*	**Commercial Corner** *Tintometer Inc.*
8:30 am – 9:00 am	**Commercial Corner** *MIOX Corporation*	**Commercial Corner** *Wincom, Inc.*
9:00 am – 10:30 am	**Education Committee Workshop: Deposit Analysis and Interpretation** Moderator: R. Trace Blackmore, CWT, LEED AP Jay Farmerie, CWT *GLA Water Consultants, Inc.* Peter E. Greenlimb, Ph.D., CWT *Chemagineering Corporation* Bruce T. Ketrick Sr., CWT *Guardian CSC*	
9:00 am – 9:45 am	**Exhibitor Meeting**	
9:45 am – 10:00 am	Refreshment Break	
10:00 am – 2:00 pm	**Exhibit Hall Open** *(Complimentary Lunch)*	
11:00 am – Noon	**Owner's Roundtable*** **This session is for current and future business owners only.*	
1:00 pm – 2:00 pm	**Learning Lounge Open** Facilitator: Bruce T. Ketrick Jr., CWT 1:00 pm – 1:30 pm—Your Company's Online Presence 1:30 pm – 2:00 pm—The Top 3 Challenges Facing Your Business	
2:00 pm – 7:00 pm	Exhibit Hall Teardown	

2:00 pm – 4:00 pm	**Track I** Moderator: Mark T. Lewis, CWT	**Track II** Moderator: Frank Lecrone III
	2:00 pm – 2:30 pm **Chloramine: Cooling Tower Contaminant or Disinfectant?** Greg D. Simpson, Ph.D. *ChemCal, Inc.*	2:00 pm – 2:30 pm **Building a Brand on a Budget** Karen Danielson *U.S. Water Services, Inc.*
	2:30 pm – 3:00 pm **Field Experience With a New, Stabilized, Chlorine-Based Cooling Water Biocide** Justin Shim *Justeq LLC*	2:30 pm – 3:00 pm **Strategic Benefit Planning and the Affordable Care Act** Michael Reddy *Keystone Insurance & Benefits Group*
	3:00 pm – 3:30 pm **Advantage of Using Onsite-Generated Chlorine vs. Conventional Chlorine** Edward T. Ott Sr. *ProMinent Fluid Controls, Inc.*	3:00 pm – 4:00 pm **Legal Actions and Lawsuits** Jay Farmerie, CWT *GLA Water Consultants, Inc.* Michael Highum *McGowan Insurance Group*
	3:30 pm – 4:00 pm **Sanikill: The New Monochloramine System to Get Rid of *Legionella* in Domestic Hot Water Systems** Stefano Melada *Sanipur US LLC*	
4:00 pm – 4:30 pm	**Reducing *Legionella*-Related Legal Risk** Moderator: Brian Jutzi, CWT Matthew Freije *HC Info*	
4:30 pm – 5:15 pm	***Legionella:* How to Protect Yourself and Your Clients** Moderator: Brian Jutzi, CWT Janet E. Stout, Ph.D. Frank P. Sidari III, PE, BCEE *Special Pathogens Laboratory* Garry Boehlert, Esq. *Saul Ewing LLP*	
5:00 pm – 6:00 pm	**Young Professionals Happy Hour**	
6:00 pm – 10:00 pm	**AWT Annual Reception and Awards Dinner** *AT&T Stadium* Buses depart at 6:00 pm from the Omni Hotel.	

CEUs Continuing Education Units (CEUs)

Certified Water Technologists (CWTs) need 25 CEUs earned through professional and academic involvement to recertify. CEUs are awarded to current CWTs for attending the AWT Annual Convention and Exposition as follows:

Full Convention Registration: 5 CEUs
One–Day Pass Registration: 1.5 CEUs per day (Thursday – Saturday)

Note: "Walk-the-Hall" and "Exhibitor Booth Staff" registrations will not qualify for CEUs.

Schedule-at-a-Glance

Saturday, November 1

7:00am – 1:30pm	**Registration Open**	
7:00am – 8:00am	**Continental Breakfast**	
7:00am – 1:30pm	Speaker Ready Room Open	
8:00am – 10:00am	**Track I** Moderator: Marc Vermuelen, CWT	**Track II** Moderator: Bruce T. Ketrick Jr., CWT
	8:00am – 8:30am **The Use of a Novel Adenosine Triphosphate Test Method to Differentiate Between Algal (Eukaryotic) and Bacterial (Prokaryotic) Microbial Biomass in Cooling Towers and Other Heat Exchange Water Systems** Frederick J. Passman, Ph.D. *Biodeterioration Control Associates, Inc.*	8:00am – 8:30am **Choosing the Best Biological Control Strategy for Your Cooling Water System** Christine E. McInnis, Ph.D. *Dow Microbial Control*
	8:30am – 9:00am **Field-Ready and Real-Time Detection of Microbiological Threats in Energy Applications** Patrick A. Whalen, P.Eng. *LuminUltra Technologies Ltd.*	8:30am – 9:00am **A New, Environmentally Compatible Corrosion Inhibitor for Evaporation Cooling Systems** Christian Zum Kolk Wolfgang Hater, Ph.D. *BK Water Solutions*
	9:00am – 9:30am **Optimizing Microbiological Control: Factors That Impact the Effectiveness of Biocides** Christopher J. Nalepa, Ph.D. *Albemarle Corporation*	9:00am – 9:30am **Beyond Corrosion Control: Sustainable Filming Amine Technology Applications for Cooling Water Systems** Mary Wolter Glass *Mexel USA*
		9:30am – 10:00am **Green Chemistry: Purified Tannin Molecules for the Protection of Mild Steel Closed-Loop Systems** Roger Gaudreault, Ph.D. *TGWT Clean Technologies Inc.*
10:00am – 10:15am	Refreshment Break	
10:15am – 12:15pm	**Track I** Moderator: Joe Russell, CWT	**Track II** Moderator: Jim Lukanich, CWT
	10:15am – 10:45am **Applying Respirometry** Elizabeth Dillman *Environmental Business Specialists, LLC*	10:15am – 10:45am **Engineered Water... Crucial for Maintaining Water-Cooled Extruder Efficiencies** Peter E. Greenlimb, Ph.D., CWT *Chemagineering Corporation* Christopher Koepke *Earthwise Environmental Inc.*
	10:45am – 11:15am **Online UV-Transmittance Measurement—The Key to Cost Savings** Oliver Lawal *Aquionics*	10:45am – 11:15am **Enhanced and Accelerated Biological Monitoring for Membrane Treatment Optimization: Measuring the Benefits of an Optimized Monitoring Program** Patrick A. Whalen, P.Eng. *LuminUltra Technologies Ltd.*
	11:15am – 11:45am **Online Monitoring of Solid Scale and Corrosion Inhibitors** Michael Hunter *APTech Group, Inc.*	11:15am – 11:45am **Biofilms: Overview of the Chemical and Biological Impact of Biofilms on Industrial Cooling Water System** Cecilia McGough *LANXESS*
	11:45am – 12:15pm **Use Of Pilot Testing in Selecting the Best Reverse Osmosis Scale Inhibitor** Matthew LaBrosse, Ph.D. *U.S. Water Services, Inc.*	11:45am – 12:15pm **Unique Non-Oxidizing Biocide Improves Microbiological Performance and Reduces Total Cooling Water Treatment Costs Compared to Traditional Non-Oxidizers** Jeffrey F. Kramer, Ph.D. *BWA Water Additives*
12:15pm – 1:45pm	Lunch Break (On Own)	
2:00pm – 3:00pm	**Deioninzation Workshop** Moderator: Al Bassett, CWT James Scott, CWT *San Joaquin Chemicals, Inc.* James McDonald, PE, CWT *Industrial Water Science LLC*	

Sunday, November 2

8:00am – 4:00pm	**Board of Directors Meeting**

Thursday, October 30 *Session Descriptions*

General Session

8:30 am – 10:00 am

AWT Annual Membership Town Hall Meeting

Be sure to attend this important meeting where we will discuss removing the restrictions on AWT membership. Make your voice heard and impact the direction of AWT!

- Call to Order
- President's Report
- New Business: Panel Discussion on AWT Membership Cap
- Q&A Period – Treasurer's Report
- Q&A Period – Committee Reports
- Q&A Period – Liaison Reports
- Approval of Minutes from October 31, 2013
- Adjournment

Commercial Corner Tracks

AWT's Annual Convention will feature Commercial Corner Tracks again this year. Presented by leading vendors in the water treatment industry, these informal mini-sessions are your opportunity to learn more about the products and services offered by these companies and the positive impact they can have on your company's operations.

Thursday, October 30

7:30 am – 7:50 am	*BWA Water Additives*	*Silver Bullet Water Treatment Company*
8:00 am – 8:20 am	*Walchem, IWAKI America Inc.*	*LuminUltra Technologies Ltd.*

Friday, October 31

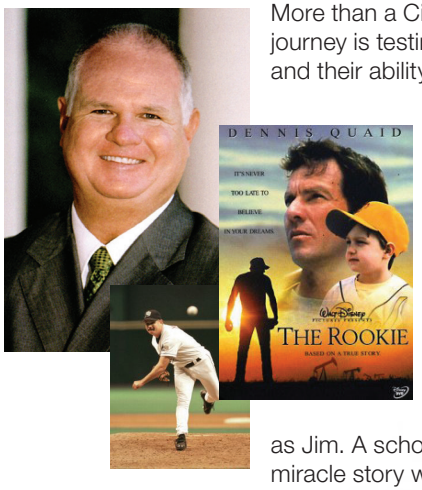
8:00 am – 8:20 am	*AMSA, Inc.*	*Tintometer Inc.*
8:30 am – 9:00 am	*MIOX Corporation*	*Wincom, Inc.*

Keynote Session

10:00 am – 11:00 am

Never Give Up On a Dream

Jim "The Rookie" Morris



More than a Cinderella story, Jim Morris' journey is testimony to the power of dreams and their ability to inspire and transform human life. A fast-track minor league player, Morris' dreams were derailed by serious arm injuries. Eleven years later, he was a high school baseball coach who unexpectedly learned a life-changing lesson from his team. Now a role model to millions, Morris' memoir, *The Rookie,* was made into major motion picture, starring Dennis Quaid as Jim. A schoolteacher by trade, Morris' miracle story will captivate and inspire you to never give up on a dream.

Thursday, October 30 *Session Descriptions*

Concurrent Sessions—**Track I** *2:00 pm – 4:00 pm*

2:00 pm – 2:30 pm

Sustainablility Through Increased Chiller Efficiency by Biofilm Removal and Prevention

Lex LaMotte
Zentox Corporation

An electric-driven chiller used for HVAC is often configured for heat rejection through evaporation. In such a configuration, a cooling tower rejects heat that is transferred in the process by a water tube condenser. Condensers are designed to reject heat to an industry standard using a heat transfer coefficient. Once the condenser is placed in service, a reduction in the heat transfer occurs as deposits form. A study at the Washington and Lee University Central Chiller Plant

was performed to verify whether the reduction of biofilm would have a substantial impact on electrical costs due to increased heat transfer. Heat transfer data were collected using the manufacturer's energy monitoring system. Additional data show significant water savings and overall cleanliness of the evaporative cooling loop.

2:30 pm – 3:00 pm

Biofilm Remediation Through the Use of Non-Oxidizing Biocides and Biofilm Release Agents

Michael Coughlin
Weas Engineering, Inc.

It is well-established that oxidizing biocides, and in particular bleach, penetrate poorly through biofilms and thus, are severely compromised in their ability to kill the underlying community of microorganisms. It is appropriate, therefore, to consider the use of non-oxidizing biocides as an alternative to oxidizing biocides for biofilm remediation. In this study, a mixed biofilm community has been selected for its ability to quickly produce a thick and durable biofilm. Biofilm release agents are evaluated independently of the non-oxidizing biocide and are used at the suppliers recommended dose. Biofilm removal is assessed by weight loss, and biofilm kill is measured by conducting total viable plate counts on the biofilm, which has been physically disrupted into a suspension of individual cells. Evaluation of non-oxidizing biocides against intact biofilm is important because biofilm release, even in the absence of biocide addition, often results in the detachment of large clusters of intact biofilm. Biofilm control and remediation are relevant within the context of water movement across heat transfer surfaces, air movement through cooling tower fill, and control of the growth of pathogens such as *Legionella*.

3:00 pm – 3:30 pm

Scale Formation: Biology, Boundary Dynamics, LSI and Sphagnum Moss

David R. Knighton, MD
Creative Water Solutions LLC

Bacteria and biofilm play a critical role in the initiation, propagation, and formation of scale. Understanding the biology of the boundary layer, how bacteria and organic contamination are involved in this process, and the result of inhibition of organic contamination by sphagnum moss demonstrates the critical role of biology in this process. Two unique species of sphagnum moss inhibit the formation of organic contamination,

absorb positively charged cations, and stabilize pH when water is exposed to the leaves. Laboratory testing of the process of scale formation and practical experience in heat exchangers and cooling towers demonstrate the effect on scale formation. Practical experience with sphagnum moss treated pools, spas, cooling towers, steam generators, hot water systems, and boilers demonstrates the ability of sphagnum moss to accomplish this in the real world. Case studies of each category will be presented.

3:30 pm – 4:00 pm

Understanding Amperometric Chlorine Measurements

John Clark
Chemtrac, Inc.

Whether monitoring disinfectant levels in a potable water treatment plant or tracking biocide residuals in a cooling water system, online chlorine measurement is of great value to the water treatment operator. Traditionally, online chlorine analyzers in the water treatment plant have utilized colorimetric measurement. With the introduction of EPA Method 334.0, however, amperometric measurement has become more prevalent. Chlorine analyzers that use amperometric sensors are not new to the industry, but there have been recent technological developments, and hence, certain crucial differences exist between the various sensor designs that result in some probes working better than others. This presentation will review the key features of amperometric technology that are important to consider when selecting an analyzer to best meet the needs of the application. Data showing the comparison between online colorimetric devices (DPD) and amperometric sensors will also be included.

Thursday, October 30 *Session Descriptions*

Concurrent Sessions—**Track II** *2:00 pm – 4:00 pm*

2:00 pm – 2:30 pm

Ground Up: Designing a New Polymer for Independent Water Treatment Companies

Mike Standish
Radical Polymers

The intent of this presentation is to introduce a new polymer and review the process of the design, development, and competitive evaluation for mineral scale control. The presentation will provide unique perspective and insight into the primary considerations of monomer selection and ratio tradeoffs, molecular weight optimization, and the balance of performance versus multiple mineral scale types. The presentation includes an overview of polymer functionality, where structure-function properties of common water treatment polymers are detailed. The concepts of threshold inhibition, crystal habit modification, and particulate dispersion are defined and applied to laboratory evaluation data for the new polymer on common mineral scales such as calcium carbonate and calcium phosphate. These data are then applied to suggested uses and formulations for cooling water and boiler applications.

2:30 pm – 3:00 pm

The Development of a Novel Antiscalant Polymer to Control the Formation of Silicate Scale

William A. Cynecki
Dow Microbial Control

Silica scale is one of the most difficult scales to remove once it has adhered to surfaces, and can eventually lead to system shutdown. It has been reported that, with the exception of organic fouling, silica is the most dominant type of fouling in reverse osmosis membranes. Silica scale is an especially significant problem in regions where ground geology contains high levels of silicaceous rocks. Because of this, silica is best controlled during its formation stage into silica/silicate scale. Controlling silica scale is a relatively well-discussed topic; however, in the past, the primary focus of research has been alkaline conditions where magnesium silicate is the main form of scale. Control of colloidal/amorphous silica scale formation, which exists mainly in neutral pH type conditions, has not been looked at in great detail. With the target of overall silica control, an innovative antiscalant has been developed. This session will focus on the performance of this novel antiscalant for silica—as well as silicate control—under various conditions.

3:00 pm – 3:30 pm

Deposit Control Polymer Selection Criteria for High-Temperature Applications

Zahid Amjad, Ph.D.
The Lubrizol Corporation

Deposit control polymers (DCPs) are essential components of successful water treatment programs. DCPs condition, suspend, and reduce adherence of particles to equipment surfaces by functioning as scale inhibitors, crystal modifiers, and/or dispersants. As components of treatment programs for high-temperature water systems (e.g., boiler, geothermal), DCPs should sustain performance under system operating pressure and temperature environments. This presentation evaluates the impact of thermal stability on DCP structure (e.g., molecular weight, composition) and performance (e.g., calcium carbonate inhibition, iron oxide dispersion, hydroxyapatite dispersion).

3:30 pm – 4:00 pm

pH Impact on Inhibitor Performance

Robert J. Ferguson
French Creek Software, Inc.

Water treatment chemists have long observed that some scale inhibitors work better at a high pH and that some inhibitors have little, if any, activity at very low pH. This session provides a framework for evaluating relative inhibitor activity using dissociation profiles for common inhibitors and calculating the distribution of inhibitor species versus pH. The use of dissociation constants for inhibitors provides a valuable tool for matching inhibitors to a specific application range pH, and as an aid in scale inhibitor selection. It can also provide a tool for evaluating and comparing new molecules. The presentation, along with the concept of active versus inactive (or less active) inhibitor forms, offers explanations for what appeared to be anomalies during the modeling of inhibitor performance data, as well as field observations such as: Why is the minimum dosage requirement for calcium phosphate inhibition by some polymers so much lower than the requirement for others? Why does the addition of pH as a variable for correlation dramatically improve the correlation coefficient (niceness of fit) for some inhibitors, even for scales whose solubility is, for all practical purposes, independent of pH? Laboratory test methods for efficacy measurement are also discussed.

Friday, October 31 *Session Descriptions*

General Session

9:00 am – 10:30 am

Education Committee Workshop: Deposit Analysis and Interpretation

Jay Farmerie, CWT
GLA Water Consultants, Inc.

Peter E. Greenlimb, Ph.D., CWT
Chemagineering Corporation

Bruce T. Ketrick Sr., CWT
Guardian CSC

Learn the causation for the formation of deposits in a water system, along with methods that could be taken to identify and prevent the deposit formation. What causes a type of deposit to form, how to interpret a deposit analysis, what practices and chemistries could have prevented the deposit, and how to remove the deposit from the system will be reviewed.

Owner's Roundtable*

11:00 am – Noon

The Owner's Roundtable is an informal, small group session for business owners to share their experiences with other business owners, or soon-to-be business owners. The discussions will include what has and has not worked, what to watch out for, and best practices.

Concurrent Sessions—**Track I** *2:00 pm – 4:00 pm*

2:00 pm – 2:30 pm

Chloramine: Cooling Tower Contaminant or Disinfectant?

Greg D. Simpson, Ph.D.
ChemCal, Inc.

Chloramine has been found to be equal to chlorine dioxide as a secondary disinfectant for hospital potable water. *Legionella* are readily inactivated by chloramine. A literature search at the time revealed no commercially available monochloramine generators, so one was fabricated and used on the cooling tower at two facilities. This presentation reports the results of a six-year study on two cooling towers. The results of laboratory testing on corrosivity and the aggressiveness to phosphonates and azoles are reported.

2:30 pm – 3:00 pm

Field Experience With a New, Stabilized, Chlorine-Based Cooling Water Biocide

Justin Shim
Justeq LLC

A stabilized, chlorine-based cooling water biocide product was introduced in the United States in 2008. This product is a single-feed, ready-to-use liquid biocide for industrial and institutional water treatment applications. The product is designed to maximize the performance of chlorine, which is by far the most popular cooling water microbial control agent because of its cost advantages. The new product breaks up slime masses from within by producing bromine in situ. The product has minimal odor and can be stored for very long periods with minimal degradation. This stability makes feeding uniquely easy. In addition, the amount of product needed is only 1/3 to 1/4 of the amount of bleach that is needed. This, combined with the fact that the need for supplemental biocides is greatly reduced, or even eliminated, makes it significantly more cost-effective than bleach. This product has been used for many different types of cooling water systems, including large industrial systems and relatively small comfort cooling water systems. This presentation summarizes the experiences in the field with this new product over the last several years and suggests the most effective ways to use it.

3:00 pm – 3:30 pm

Advantage of Using Onsite-Generated Chlorine vs. Conventional Chlorine

Edward T. Ott, Sr.
ProMinent Fluid Controls, Inc.

With increasing regulations related to transporting, storing, and using chlorine gas or sodium hypochlorite, the need for onsite-generated chlorine is increasing. For applications using sodium hypochlorite, much of the transportation and storage cost is primarily due to the water content. For example, if you have 12% sodium hypochlorite, 88% of it is water and other substances. Over a short period, the chlorine decomposes further into things like chlorite or chlorate, and the solution is no longer at the original 12% strength. In addition, using liquid sodium hypochlorite adds a lot of salt to a process.

3:30 pm – 4:00 pm

Sanikill: The New Monochloramine System to Get Rid of *Legionella* in Domestic Hot Water Systems

Stefano Melada
Sanipur US LLC

Monochloramine is a well-known disinfectant for drinking water, with several advantages over chlorine and chlorine dioxide. Monochloramine is included in the U.S. EPA list of disinfectants for drinking water. At the beginning of the 21st century, epidemiological studies demonstrated monochloramine's superior ability to control *Legionella* in hot water healthcare premises. In 2005, a research program was set up to provide a reliable and effective method for producing monocloramine directly in domestic hot water systems, at the safest concentration and without accumulation of byproducts. The results of this research, which has been carried out in collaboration with Italian and American institutions, showed that monocloramine can be safely and reliably prepared and that it is the best approach to *Legionella* remediation in healthcare facilities.

Friday, October 31 *Session Descriptions*

Concurrent Sessions—**Track II** *2:00 pm – 4:00 pm*

2:00 pm – 2:30 pm

Building a Brand on a Budget

Karen Danielson
U.S. Water Services, Inc.

Marketing for any small to mid-size business can be challenging, especially on a limited budget. Deciding on where and how to market and determining whether or not the tactics used were effective can be a daunting task that often gets overlooked in favor of more pressing business matters. In this session, learn some tips on how to effectively build a brand in your area and develop relationships that have the potential to lead to sales.

2:30 pm – 3:00 pm

Strategic Benefit Planning and the Affordable Care Act

Michael Reddy
Keystone Insurance & Benefits Group

This session will focus on helping business owners get compliant and remain compliant with the Affordable Care Act following full implementation in 2014. Additionally, instruction will be provided not only on staying compliant so that the business is within the letter of the law, but also in creating a benefits platform that attracts and retains the type of employee the business desires to keep. This is done intentionally through a thoughtful strategic planning process that integrates the corporate goals with the employee benefits program.

3:00 pm – 4:00 pm

Legal Actions and Lawsuits

Jay Farmerie, CWT
GLA Water Consultants, Inc.

Michael Highum
McGowan Insurance Group

In today's world, lawsuits are occurring in every industry—even in the water treatment industry! What you must realize is that you cannot avoid being sued, but you can reduce the potential costs one would incur with litigation. Costs include not just out of pocket expenses like lawyer's fees, expert witness fees, and metallurgical laboratory work, but also time involving meetings, depositions, and the like. Even in a lawsuit in which a water treater was not responsible, within the first two months of a case, costs reached six figures, all of which the water treater was unable to recover. During this session, the presenters will use insights gleaned from other cases to discuss the conditions that brought about the suits and corrective actions that you can take to reduce your liability.

General Session

4:00 pm – 4:30 pm

Reducing *Legionella*-Related Legal Risk

Matthew Freije
HC Info

This session will provide an overview of *Legionella*-related litigation, the four factors that determine a water treater's legal risk, and six ways to reduce risk. It will also provide new information on this topic and and leave a significant amount of time for questions. This session will not provide legal advice but simply give information based on serving as an expert in Legionnaires'-related lawsuits.

4:30 pm – 5:30 pm

***Legionella*: How to Protect Yourself and Your Clients**

Janet E. Stout, Ph.D.
Frank Sidari III, PE, BCEE
Special Pathogens Laboratory

Garry Boehlert, Esq.
Saul Ewing LLP

Proposed *Legionella* standards from ASHRAE and CTI have increased your client's awareness (and anxiety). Now more than ever, water treatment professionals are on the front line for *Legionella* control. How to balance working with your clients while ensuring you have a legal safety net can be a challenge. This session explores 1) what's new in Legionnaires' disease, including detection methods and *Legionella* control, 2) options for working with your clients to provide risk management, and 3) strategies to limit your exposure to *Legionella*-related claims.

Saturday, November 1 *Session Descriptions*

Concurrent Sessions—**Track I** *8:00 am – 10:00 am*

8:00 am – 8:30 am

The Use of a Novel Adenosine Triphosphate Test Method to Differentiate Between Algal (Eukaryotic) and Bacterial (Prokaryotic) Microbial Biomass in Cooling Towers and Other Heat Exchange Water Systems

Frederick J. Passman, Ph.D.
Biodeterioration Control Associates, Inc.

Adenosine triphosphate (ATP) testing has become a staple method for rapidly estimating microbial bio-burdens in various water systems, including in cooling towers and other heat exchange systems. However, previous ATP data provided only an indication of total levels of microbial contamination in these systems. Moreover most ATP test methods do not differentiate between cellular ATP (cATP) and ATP that is associated with cell fragments or otherwise in extracellular form. This session reports a modification of the method to differentiate between cATP from eukaryotic cells and cATP from prokaryotic cells. The method relies on a combination of surfactant and filtration technologies and has been vetted in both laboratory and field evaluations. The developmental process, laboratory validation, and field verification results are presented. The method provides cooling tower and heat exchange system personnel with a tool for rapidly quantifying and differentiating between algal and bacterial contamination—thereby facilitating onsite selection and application of appropriate antimicrobial treatments.

8:30 am – 9:00 am

Field-Ready and Real-Time Detection of Microbiological Threats in Energy Applications

Patrick A. Whalen, P.Eng.
LuminUltra Technologies Ltd.

Biocide programs are one effective way to control bio-burden in energy applications, but without timely and proactive monitoring, it is difficult to properly manage such programs. In recent years, there has been an increased emphasis on the use of molecular methods for the detection of microorganisms in energy applications. One such molecular method is the 2nd Generation ATP test, which was introduced in the energy sector in the early 2000s. This technique builds upon traditional ATP tests that have been successfully utilized in food processing and packaging applications for decades, and enables the same rapid measurement and response capability as has grown to be a custom in those industries. ATP is the central energy carrier for all living cells; hence, the measurement of ATP relates directly to the total quantity of living cells. In addition, the methodology to measure ATP is portable and provides results in a matter of minutes, compared to days or weeks for traditional culture-based tests. This session will summarize how the 2nd Generation ATP test has been successfully applied to both upstream and downstream energy applications as part of anti-corrosion, anti-fouling, and anti-souring strategies. It will also present data compiled to achieve method standardization and validation (e.g., ASTM D7687).

9:00 am – 9:30 am

Microbial Testing 101: How You Can Bring Value to Your Clients

Anne W. Burt
Phigenics, LLC

Today's facility manager is becoming increasingly concerned with safety and liability associated with waterborne pathogens in utility and potable water. Pathogenic organisms are those that cause disease in humans. This session will discuss how these organisms enter and proliferate in water systems. *Legionella* are one of the most familiar pathogens, but there are others, including Acinetocbacter, Aspergillus, Coliforms, Mycobacteria, and Pseudomonas, that also pose a threat to facility occupants. An important step in controlling these microbial populations is to validate their existence through quantitative and qualitative testing. Numerous testing methods are available, and choosing the right method is important to understanding the threat of the particular organism in a facility. This presentation will review the pros and cons of various test methods, share details about limits of detection, discuss the techniques of sampling, and address the effects of sample holding time. The session will review the importance of lab certification and specifically explain the Centers for Disease Control and Prevention ELITE Certification Program for *Legionella*. Lastly, the session will cover how this expanded offering can help you achieve increased value for you and your clients.

9:30 am – 10:00 am

Optimizing Microbiological Control: Factors That Impact the Effectiveness of Biocides

Christopher J. Nalepa, Ph.D.
Albemarle Corporation

Although industrial biocides can be effective microbiological control agents, using of them alone cannot guaranty a successful microbiological control program. Many factors can adversely impact the performance of a biocide program—the makeup water source, system impurities, corrosion and deposit control agents, system metallurgy, system design and operational parameters, UV exposure, and maintenance practices, among others. Some of these factors are within the control of the water treatment professional; others are not. One certainty is that biocides must be handled and dosed properly in order to achieve the optimum effect. The purpose of this presentation is to discuss the key factors that will help you optimize biocide performance. These factors will be illustrated using a combination of lab studies, microbiological tests, and field observations. This session will primarily focus on oxidizing biocides, but the principles introduced hold for any biocide of interest.

Saturday, November 1 *Session Descriptions*

Concurrent Session—**Track II** *8:00 am – 10:00 am*

8:00 am – 8:30 am

Choosing the Best Biological Control Strategy for Your Cooling Water System

Christine E. McInnis, Ph.D.
Dow Microbial Control

Maintaining biological control of your cooling water system is important for the overall health of the system. Biological growth can affect corrosion and scale, and biofilm can reduce efficiency of heat exchangers and fill. While maintaining biological control in a cooling water system is critical, it can be difficult and vary from system to system. This presentation will explore common ways of controlling microorganisms using oxidizing and non-oxidizing biocides. In addition, the differences in mechanisms of action, kill rates, corrosion, dosing frequency, testing protocol, and perceived product safety will be evaluated. These factors are

critical to determining what kind of microbial control strategy may be best for the systems you treat.

8:30 am – 9:00 am

A New, Environmentally Compatible Corrosion Inhibitor for Evaporation Cooling Systems

Wolfgang Hater, Ph.D.
BKG Water Solutions

State-of-the-art corrosion inhibitor programs for evaporative cooling systems are based on phosphate, phosphonates, and zinc, and combinations thereof. A need exists for corrosion inhibitors having an improved environmental profile and/or an improved performance. This session shows the results obtained with a newly developed corrosion inhibitor. The molecule is free of heavy metals and is characterized by an excellent environmental profile. Electrochemical methods (e.g., voltammetry, polarization resistance) were applied, as were beaker tests and long-term tests in cooling circuit simulating devices. Therefore, the efficiency of the new inhibitor as well as of combinations with other organic inhibitors has been studied. Finally, the new inhibitor has been tested in a pilot cooling tower under practical conditions. The results of the corrosion tests clearly show an excellent efficiency of the new corrosion inhibitor. Significant synergies could be identified between the new substance and other inhibitors. The pilot plant studies of a formulation based on the new corrosion inhibitor show better, or at least the same, performance compared to commercially available corrosion inhibitors but a marked reduction of the phosphorus entry into the wastewater. The improved performance can be transferred directly into savings.

9:00 am – 9:30 am

Beyond Corrosion Control: Sustainable Filming Amine Technology Applications for Cooling Water Systems

Mary Wolter Glass
Mexel USA

This presentation will address the science behind filming amines and their environmental benefits. Then, the field experience and treatment programs from companies that have used and rigorously tested the amines will be shared. A single blended amine emulsion can address multiple problems; biofouling, biofilm, scaling, corrosion, and sedimentation. These specially designed blends act differently, targeting only the wetted internal surfaces of the water circuit to protect it with a molecular coating. Extensive laboratory and field testing have proven the benign character of these products, which are discharged in small quantities and do not impact public water treatment systems. The products can be employed in fresh, salt, and reclaimed water. Expert research has shown that, in addition to the corrosion control, select blended amines can prevent biofilm buildup and control scaling. When properly implemented in cooling tower systems, there should be no detectable chemical discharge to the environment from the brief daily dosing of very small quantities of the amines. Economic advantages of the systems include the condensed nature of the products and that they require lower labor, transport, storage, and equipment costs. Amine emulsions do not burn, explode, or volatilize, which creates a safer environment for service technicians, customers, and the public.

9:30 am – 10:00 am

Green Chemistry: Purified Tannin Molecules for the Protection of Aluminum and Mild Steel Boilers

Roger Gaudreault, Ph.D.
TGWT Clean Technologies Inc.

Purified tannin green molecules meet today's industrial water treatment needs while reducing water use, energy use, and greenhouse gas emissions. Tannin molecules are extracted from renewable resources and protect steam boilers well above ASME guidelines. In this study, different methods, including electrochemistry and video modeling, were performed to characterize the protective tannin-based layer for hot water aluminum and mild steel boilers. A range of purified tannin-based additives (originally made for steel) in aluminum boilers has been developed. The latest results support and reinforce the previous findings. Tannin adsorption isotherms were performed to determine the maximum amount that could form the protective layer on aluminum and mild steel surfaces. Moreover, field data will be presented to show the corrosion inhibition efficiencies on aluminum and mild steel boilers.

Saturday, November 1 *Session Descriptions*

Concurrent Sessions—**Track I** *10:15 am – 12:15 pm*

10:15 am – 10:45 am

Applying Respirometry

Elizabeth Dillman
Environmental Business Specialists, LLC

Respirometry is the measurement and interpretation of biological oxygen consumption or gas production under experimental conditions. Under aerobic conditions, oxygen utilization is directly associated with both bacterial reproduction and substrate removal, so respirometry is a useful technique for monitoring, modeling, and controlling biological processes. Historically, aerobic respirometry was viewed as an instrumental alternative to Biochemical Oxygen Demand (BOD) testing of wastewater samples. Over the past two decades, many new types of commercial respirometers have been developed, making the technology more available to consultants and design engineers. More recently, open respirometer systems have been introduced. Open respirometry offers the operator the opportunity to more closely simulate actual operating conditions in the activated sludge system. With sophisticated software, kinetic modeling, and BOD fractioning, studies can also be performed. This session presents test protocols and results from several respirometry studies conducted over the last few years using both open and closed systems. We will show that respirometry can be a vital tool in understanding a wastewater treatment system by giving operators and engineers options to aid in increasing treatment efficiency and to overcome upset conditions.

10:45 am – 11:15 am

Online UV-Transmittance Measurement—The Key to Cost Savings

Dan Shaver
Aquionics

Insufficient or inaccurate historical UV transmittance (UVT) data can lead to the imprecise design and sizing of a UV disinfection system. In addition to how the UVT parameter is used in the planning stages of a UV project, the inability to detect immediate changes in UVT as part of a facility's continuous water quality monitoring can lead to unnecessary energy consumption (overdosing) or compromised water quality (underdosing). When a UV disinfection facility is in operation, the water conditions often change on a daily basis, and the actual UVT could be significantly better than what the historical data has shown for the same time period. Due to the nature of UVT and the bias toward detecting changes in organic matter, the UVT parameter can be used to signal a change in performance of many TOC removal processes, such as ion exchange, coagulation, GAC filtration, and UF/NF membranes. While UVT is not linearly proportionate to the change in concentration of organic matter in the water, it is a practical alternative to signal an overall change or compromise in the treated water from one of the above processes upstream from a UV disinfection system. This makes it a viable, practical, and affordable alternative to other organics monitoring techniques, such as TOC.

11:15 am – 11:45 am

Online Monitoring of Solid Scale and Corrosion Inhibitors

Michael Hunter
APTech Group, Inc.

The use of solid water treatment scale and corrosion inhibitors for cooling water systems has been successfully demonstrated to be a viable and sustainable alternative to liquid chemistry for well over a decade. Most of the advantages associated with using solid products have been related to safety, material handling, saving space, shipping, and the associated reduction of the carbon footprint (e.g., one case of four bottles weighing 44 lbs is equivalent to a 500 lb drum of a traditional liquid inhibitor). Solids are dissolved, just prior to point of use, by means of a unique on-demand mechanical system that controls the amount of spray during each dissolving interval. The solution is then introduced into the water system by various methods. Perceived inconsistencies in solution strengths are eliminated with the addition of PTSA dye-tracing of these products with 24/7 online monitoring. System probes detecting minute amounts of dye signal changes to dispensing equipment (i.e., pumps, eductors, and solenoids). PTSA traced products can also be tested with a handheld device, eliminating time-consuming wet-test methods, which can be prone to interference and technician errors. Data from beta testing of several systems will be demonstrated to show more consistent results.

11:45 am – 12:15 pm

Use Of Pilot Testing in Selecting the Best Reverse Osmosis Scale Inhibitor

Matt LaBrosse, Ph.D.
U.S. Water Services, Inc.

As the water treatment industry strives to be environmentally responsible by saving and reusing water, reverse osmosis (RO) continues to play a vital role in the pretreatment of industrial water systems. By reducing the dissolved solids of the water to be used, it is often possible to reduce water and chemical usage by increasing cycles of concentration, decreasing heat loss, and increasing overall efficiency of the system. Thus, it becomes essential to increase reverse osmosis recovery rates and yet prevent problems associated with membrane deposition. Using $CaSO_4$ and $CaCO_3$ as a focus, this presentation investigates methods for maximizing the success of the effective use of reverse osmosis chemical inhibitors, especially polymers and phosphonates, to maintain reverse osmosis efficiency.

Saturday, November 1 *Session Descriptions*

Concurrent Sessions—**Track II** *10:15 am – 12:15 pm*

10:15 am – 10:45 am

Engineered Water… Crucial for Maintaining Water-Cooled Extruder Efficiencies

Peter E. Greenlimb, Ph.D., CWT
Chemagineering Corporation

Christopher Koepke
Earthwise Environmental, Inc.

Properly engineered water is the preferred industrial heat transfer medium because its heat capacity is almost twice that of organic-based coolants. In water-cooled extruder barrel cooling, conventional water treatment technologies fail due to the deposition of inhibitory additives in the narrow passageways of zone heater/coolers. This presentation introduces some successes with the use of engineered water in water-cooled extruder cooling systems. Key presentation points supported from field studies confirm that a simple maintenance program based on a two-product restoration/application approach ensures dependable extruder performance and service, maximizes extruder output, and eliminates downtime due to cooling system corrosion and fouling. In addition, using engineered waters as industrial coolants maximizes account production capability and water management service company profitability, without increasing a service technician's field obligations.

10:45 am – 11:15 am

Enhanced and Accelerated Biological Monitoring for Membrane Treatment Optimization: Measuring the Benefits of an Optimized Monitoring Program

Patrick A. Whalen, P.Eng.
LuminUltra Technologies Ltd.

The membrane filtration plant located in southern Louisiana experienced severe membrane fouling due to biological growth. In the past, organics were oxidized and broken down by chlorination prior to passing through prefilters and then a set of membrane filters. However, this practice had gone out of favor due to production of disinfection by-products (DBPs) such as Trihalomethanes (THMs) and Haloacidic Acids (HAAs). The utility therefore sought to remove pre-chlorination, but complete removal of pre-oxidation resulted in severe membrane fouling and eventual failure. Upon investigation, it was found that proactive biological monitoring using advanced ATP (Adenosine Triphosphate) was able to guide mitigation activities and optimize several design modifications to provide improved plant operation and product water quality. In this situation, ATP monitoring quickly identified elevated microbial content not only in the raw water, permeate, and reject, but also within the membranes themselves. This enabled personnel to assess the effects of decreased pre-chlorination, diagnose the fouling issue as a biological problem, and optimize of the membrane cleaning process. The design changes that were implemented based on this enhanced monitoring scheme had proven to be very effective. The results of this modification included: far lower microbial content (as indicated by ATP monitoring) in the permeate streams, enhanced biostability resulting in the ability to maintain chlorine residual for a longer period, and thousands of dollars per month in electricity savings due to reduced fouling and the head loss that occurs across fouled membranes.

11:15 am – 11:45 am

Evaluating Biocide Blends for Biofilm Efficacy in Cooling Water Systems

Cecilia McGough
LANXESS

This presentation will focus on understanding the role of biocides in controlling the biofilms in cooling water systems. The first half of the presentation will provide an overview of what a biofilm is, how they are established, and the areas of concern within the cooling tower system. The many components in each layer of the biofilm and their interactions are fundamental to biofilm function. Key to the biofilm is the different microorganisms associated with cooling water biofilms. These microorganisms, in combination with the formation of the biofilm, contribute to the development of microbial-induced corrosion or the reduction of heat transfer within the cooling water system. The presentation will further define microbial-induced corrosion and the impact on the cooling water system. Microbial-induced corrosion is a major concern for water treatment companies. The second half of the presentation will focus on the biocide efficacy studies performed on biofilms. The presentation will cover the details of the test protocol, how the biofilm systems were evaluated, and the chemistry of each of the biocide system. Results of the individual efficacy studies will be reviewed, and conclusions from the studies will be presented.

11:45 am – 12:15 pm

Unique Non-Oxidizing Biocide Improves Microbiological Performance and Reduces Total Cooling Water Treatment Costs Compared to Traditional Non-Oxidizers

Jeffrey F. Kramer, Ph.D.
BWA Water Additives

Cost-conscious end-users continue to challenge their water treatment service providers to offer the best treatment solutions at the lowest cost, yet end-users are unwilling to trade off performance for cost. Cooling water service providers are often faced with difficult microbiological control conditions, which compromises their ability to reduce the end-user's treatment costs while maintaining a profitable account. This presentation examines how a relatively new, blended, non-oxidizing biocide of tributyl tetradecyl phosphonium chloride (TTPC) improves microbiological performance while reducing total cooling water treatment costs compared to industry standard non-oxidizers such

Saturday *continued*

as isothiazolone. Detailed lab and field trial data are presented to show improved microbiological performance up to four times more effective than isothiazolone and up to 20 times more effective than glutaraldehyde when used in combination with halogens. Field trial data ranging from industrial cooling towers to air handling units demonstrate total treatment cost savings in the range of 30–60%.

General Session

2:00 pm – 3:00 pm

Deionization Workshop

James Scott, CWT
San Joaquin Chemicals, Inc.

James McDonald, PE, CWT
Industrial Water Science LLC

Deionization is the process whereby ordinary tap water is transformed into ultrapure water, or purified water somewhere between tap water and ultrapure water depending on the requirements of the process to be supplied by the modified water. The first step is to accurately define the quality of the water required, followed by designing and obtaining equipment and resins to accomplish the stated goal.

Exposition

AWT members consistently rate the Exposition as one of the top benefits of attending the Annual Convention. The 2014 AWT Exposition provides attendees with the best opportunity to discuss the latest technologies and applications with the industry's leading suppliers. Where else can you meet face to face with such a diverse group of experienced suppliers—all under one roof? Quite simply, no other show comes close to delivering the high-level supplier interaction you need to build business relationships that count.

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Room Rate $189/night

Reservation Deadline Friday, October 3, 2014

Please remember to mention that you are with "AWT" to obtain the discounted group rate. The group room rate is available on a first-come, first-served basis until **Friday, October 3, 2014**, or until the block has sold out.

Located in the heart of Fort Worth's exciting downtown, the Omni Fort Worth Hotel is adjacent to the Fort Worth Convention Center and within walking distance of the city's cultural centers, restaurants, and nightlife. With its dramatic art, exciting venues, Texas hospitality, and casual yet sophisticated style, the Omni Fort Worth is the place to retreat in the Lone Star State.

Omni Select Program

If you are not already a member of the Omni Select program, be sure to **sign up** www.omnihotels.com/FindAHotel/FortWorth/MeetingFacilities/AssociationofWaterTechnologies10n.aspx. Get rewards instantly with complimentary in-room Wi-Fi, pressing service, morning beverage delivery, and much more.

Air Travel

Dallas/Fort Worth International Airport (DFW)

25 miles to Omni Fort Worth

Dallas Love Field Airport (DAL)

35 miles to Omni Fort Worth

United Airlines has partnered with AWT and is offering all attendees discounted airfare. When booking online at www.united.com use **Offer Code: ZS58790644**. If you call (800) 426-1122, please remember to give them the following information: **Agreement Code: 790644 Z Code: ZS58**

Ground Travel

From Dallas/Fort Worth International Airport (DFW)

25 miles (approx. 28 minutes) to Omni Fort Worth

Taxi Service: Approximately $60 each way

Shuttle Service: Daily departures from DFW International Airport every 30 minutes between 6 am and 3 pm, approximately $18 per person; Super Shuttle available 24 hours. (972) 615-2410.

Trinity Railway Express: The Trinity Railway Express links DFW International Airport to downtown Fort Worth's T&P Station, located two blocks from Omni Fort Worth, Monday through Saturday. A single-trip ticket to stations west of CentrePort/DFW Airport Station is $2.50.

From Dallas Love Field Airport (DAL)

35 miles (approx. 40 minutes) to Omni Fort Worth

Taxi Service: Approximately $85 each way

Shuttle Service: Reservation required; Approximately $45 each way per person; Super Shuttle available 24 hours (972) 615-2410.

Car Rental AVIS

AWT has partnered with Avis to provide rental cars at a discounted rate. You can contact Avis directly at (800) 331-1600 (refer to AWD# J965598) or www.avis.com/car-rental/reservation/initialize-reservation.ac?&AWD_NUMBER=J965598 to get the discounted rate.

Parking

Valet Parking: $25 overnight; $15 daily

Self-Parking: Available at the city-operated garage adjacent to the hotel for $15 per day. Garage entrance is on 11th Street between Houston and Throckmorton. Please ask for details at the front desk when checking in.

Molly the Trolley: A free trolley service with routes through downtown. Picks up in front of the Omni Hotel. For more information please visit http://www.mollythetrolley.com/.

Weather/Attire

The average daytime temperature in Fort Worth at the end of October is 72 degrees, while evenings average 50 degrees. The dress code is business casual.

Fort Worth, Texas

Fort Worth is known as the city of "Cowboys and Culture" and is famous for being "Where the West Began." Fort Worth is home to the country's third largest cultural district and offers a unique mix of entertainment and attractions. There is lots to do and see, from the Fort Worth Stockyards to the entertainment in Sundance Square to the diverse musical offerings. Plus, for those looking to explore the outdoors, you can bike, hike, or horseback ride along 88 miles of trails along the Trinity River or check out the hiking trails at the Fort Worth Nature Center and Refuge.

Registration Form

AWT 2014 Annual Convention and Exposition

October 29 - November 1, 2014 • Omni Fort Worth and Fort Worth Convention Center • Fort Worth, Texas

1 Attendee Information

☐ Member ☐ Non-Member

First Name _____ Middle Initial _____

Last Name _____ Suffix _____

First Name on Badge _____

Company _____

Company Address _____

City _____ State _____ Zip _____ Country _____

Telephone _____ Fax _____

Email *(Confirmations & meeting notices will be sent to this email address)* _____

Emergency Contact Name and Telephone _____

Special Accommodations/Meals Requested

☐ Vegetarian ☐ Kosher ☐ Low sodium ☐ Low fat

☐ Other _____

2 Full Convention Registration

Full Convention Registration includes:

- Continental breakfast each day
- Online access to papers and presentations
- Admittance to all educational sessions
- Admittance to the Exposition Hall
- One complimentary ticket to the Annual Reception and Awards Dinner

Early Registration by 9/19/14	Member 1st attendee	☐ $515
	Member additional attendee	☐ $485
	Non-Member attendee	☐ $725
Regular Registration after 9/19/14	Member 1st attendee	☐ $630
	Member additional attendee	☐ $600
	Non-Member attendee	☐ $880

☐ **Yes, I will attend the Annual Reception and Awards Dinner at Dallas AT&T Stadium Friday, October 31, 6:00 pm – 10:00 pm** (box must be checked to obtain ticket)

3 Additional Tickets

Annual Reception and Awards Dinner

Full Convention Registration already includes one complimentary ticket to the Annual Reception and Awards Dinner, Friday, October 31, 6:00 pm – 10:00 pm

#_____ x $80 /ticket = $_____

Name on badge for additional attendee(s) _____

4 One-Day Pass Registration

(A maximum of two, one-day passes may be purchased.)

One-Day Pass Registration includes:

- Continental breakfast for that particular day
- Online access to papers and presentations
- Admittance to all educational sessions for that particular day
- Admittance to the Exposition Hall for that particular day

Member	☐ $200	Non-Member	☐ $300

Please indicate day choice:

☐ Wed., Oct. 29 ☐ Thurs., Oct. 30 ☐ Fri., Oct. 31 ☐ Sat., Nov. 1

5 Golf Tournament Registration

Wednesday, October 29, 2014, 8:00 am – 4:00 pm
(Deadline to register is Friday, October 17)

Golf Registration includes:

Full buffet breakfast, golf cart, lunch on the course, and eligibility for several prizes.

Member	☐ $150/player	Non-Member	☐ $180/player

Mulligan(s) $20 each x _____ = $_____(total)
(Proceeds go to the Humane Society of North Texas.)

Handicap or Average Score:_____

You must submit your handicap or average score to participate.

☐ Yes, I anticipate using the bus for transportation to the Texas Star Golf Course. The course is located approximately 20 minutes from the hotel.

If you need to rent clubs, please contact the pro shop at (817) 685-7888. Club rentals are $50 plus tax. In order to guarantee club rentals, be sure to contact the pro shop two weeks prior to the golf outing.

6 Total Payment: $ _____

Check enclosed (made payable to "AWT") Check #:_____

Credit Card: ☐ Visa ☐ MasterCard ☐ American Express

Card Number _____

/
Expiration Date _____ Security Code _____

Signature _____

Questions?

Registration	Shannon Sperati, Member Services Manager ssperati@awt.org or (240) 404-6491	**Fax**	(301) 990-9771
Logistics/ Accommodations	Grace Jan, CAE, CMP, Vice President, Meetings gjan@mgmtsol.com or (240) 404-6479	**Mail**	Association of Water Technologies 9707 Key West Avenue, Suite 100 Rockville, MD 20850
Golf/Exhibits Sponsorship	Barbara Bienkowski, CEM, Exhibits and Sponsorships Manager bbienkowski@awt.org or (240) 404-6481	**Online registration**	awt-annual14.org
Cancellation Policy	All cancellations must be in writing and are subject to a $50 processing fee. No refunds will be made after Friday, September 19, 2014. No exceptions.		

Association of Water Technologies
9707 Key West Avenue, Suite 100
Rockville, MD 20850

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October 29– November 1, 2014
Omni Fort Worth and Fort Worth Convention Center
Fort Worth, TX

2014 Annual Convention and Exposition