

↔↔↔ **Hotel Maps Inside...**

### **REMINDER...**

As a courtesy to the Speakers and fellow attendees, the IWC requests that all cell phones and pagers be set to "vibrate" or "silent mode" while in all Presentation rooms.

Please wear your IWC-issued name badge at all times during conference activities. Your name badge is your passport to all conference activities, and lists several important telephone numbers on the back.

### **LOCATION OF SUITES:**

The following Suites are located on the Mezzanine level:

Azalea  
Begonia  
Camelia  
Dogwood  
Edelweiss  
Fuschia  
Gardenia  
Hibiscus  
Iris  
Jasmine  
Kahili  
Lily  
Magnolia  
Narcissus  
Orange Blossom  
Poinsettia  
Quince

Please consult the map inside the back cover of this program for specific locations. All other suites are located on sleeping room floors.

  
**Don't miss the  
69th Annual  
International Water  
Conference®  
October 26-29, 2008  
at the  
Crowne Plaza  
Riverwalk Hotel  
in San Antonio, Texas**



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The opinions expressed in this program are not necessarily those of the International Water Conference Executive Committee, Advisory Council or the Engineers' Society of Western Pennsylvania. Speakers and program content are subject to change.

# **68th ANNUAL INTERNATIONAL WATER CONFERENCE®**

**OCTOBER 21-25, 2007**

**at the Hilton in the  
WALT DISNEY WORLD® Resort  
Orlando, Florida, USA**



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## About the Cover

The Florida evening sun sets behind a collection of palm trees. Water treatment facilities and apparatus photos courtesy of Puckorius & Associates. Cover Design by Sherie Stark/ABC Imaging.

## GENERAL INFORMATION



Welcome to Orlando and the 68th Annual International Water Conference® (IWC). The Engineers' Society of Western Pennsylvania, the IWC Advisory Council, and the Executive Committee are very pleased with the progress of the plan outlined a few years ago to adapt the IWC to the changes occurring in the water industry nationally and internationally. Please

review this year's program carefully, as it reflects our efforts to continue to offer diversity in selecting the technical papers for the conference. We continue to offer timely sessions that will appeal to anyone who is active in the field of water and wastewater including Legionella Control, Zero Liquid Discharge, Biological Treatment, Flue Gas Desulphurization (FGD) Wastewater Treatment, Membranes, and Resin Technologies. Preparing for the next decade of power plants, we have added a technical session on the Resurgence of Nuclear Power that now appears to be a viable solution for developing and industrialized countries. We are offering many Continuing Educational Workshops (CEWs) for attendees to learn from professionals in their fields and accumulate CEW credits for their professional registration or merit. This year we are experimenting with a poster session that allows inventors and presenters to demonstrate their ideas to the conference attendees without being tied down to a technical session. I am sure it will be difficult to narrow down the sessions that you will attend from the four technical sessions that are being presented concurrently. However, we manage and adhere to our allocated time and schedule of our technical papers to allow attendees to locate from one session to another should they wish to maximize the benefits from participation in this year's conference.

Our exhibit hall is conveniently located near the technical session rooms and is filled with exciting displays from our dedicated participants. We are very fortunate to be at the Hilton in the Walt Disney World Resort. As you will see the Hotel/Conference Center is ideally laid out for a conference like ours. Once again, we can have the exhibit hall on the same floor as the technical sessions. We are also able to take advantage of the larger exhibit area available and draw more exhibitors, which will enhance the experience of the attendees. The hotel is adjacent to the Disney Marketplace allowing for a multitude of evening options. In addition, there are spousal programs, coffee klatches, and brunches to allow the visitors and guests to enjoy their time in a leisurely fashion.

This year's Keynote Speaker is Dr. William Joyce, CEO of Nalco. He will address the Plenary Session on Environmental Sustainability and Resource Conservation and how improved control in water treatment enables the industry to reduce energy use and associated greenhouse gases. He will address water recycle and protection of other scarce water sources such as surface and ground water. His presentation promises to be extremely interesting and timely.

Finally, I want to recognize the dedication and hard work of the members of the Executive Committee and Advisory Council in volunteering to take additional tasks. I want to especially recognize this year's Technical Program Committee under Wayne Bernahl, Marketing Committee under Mike Gottlieb, Jim Sabzali, and Manoj Sharma, and the New Member Outreach Committee under Joe Loftis. They have done a superb job in bringing this conference together with the help and valued assistance of all other members of the Executive Committee and the (cont'd...)

## GENERAL INFORMATION

Advisory Council Companies. I also thank the authors, co-authors, session chairs, discussion leaders, and the discussers for moving the IWC forward and keeping the high quality of the IWC papers for which we are known. Please seek them out and extend your appreciation for all of their efforts. Rest assured, the work is not finished, and we want to make even more improvements next year. We would like to encourage everyone to become part of the IWC planning and implementation process. I am pleased to welcome Manoj Sharma, Dan Rice, and Jim Dromgoole to the IWC Executive Committee. Also, many new companies have joined the Advisory Council this past year. Please feel free to approach any member of the IWC staff or Executive Committee to voice your interest, and we can review the options for your involvement. I hope you find this year's Conference worthwhile and enjoyable, and hope to see you again in 2008 in San Antonio, Texas!

Kumar Sinha

2007 IWC General Chair

Principal Engineer, Bechtel Power Corporation

### REGISTRATION DESK

The Registration Desk Hours of Operation are:

Sunday:	5:00 pm to 8:00 pm
Monday:	7:30 am to 5:00 pm
Tuesday:	7:30 am to 5:00 pm
Wednesday:	7:30 am to 12:00 pm

### NAME BADGE IDENTIFICATION

Please wear your badge on your right side at all times. Your badge is your passport to Technical Sessions, the Exhibit Hall, and International Water Conference® social functions. In addition, important local phone numbers have been printed on the back of your badge for your use.

### MESSAGE BOARD

As a service to conference registrants, a Message Board will be located at the Registration Desk. The board will be maintained by the registration staff from 8:00 a.m. Monday through noon on Wednesday. The messages will be retained until the end of each day.

### REGISTRATION LISTS

Registrations received prior to October 12, 2007 have been compiled in THE IWC REGISTRATION LIST. This popular service provides attendees with additional networking opportunities.

An Addendum will be made available on-line containing those attendees that registered after October 12, 2007 and on-site during the Conference. Please visit the IWC web site.

An Electronic version of the full Registration List will be available at the Registration Desk the morning of Wednesday, October 24. It provides the names of all registered attendees in both Excel and comma-delimited text formats. There is a \$25 administrative charge.

# GENERAL INFORMATION

## PRE-PRINT LOCATION

Pre-prints for all technical presentations are available at the Pre-Print Area located beside registration. Pre-prints can be purchased for \$3.00 per copy. Also, you can find copies of previous years' IWC Proceedings (for \$55 per volume). The Pre-Print Area will be open Monday and Tuesday from 8:00 am to 5:00 pm, and Wednesday 8:00 am to 12:00 noon.

## PREPARED DISCUSSIONS

Each Technical Paper presentation is followed by a Prepared Discussion, giving you a thoroughly considered, different perspective. Also, all presentations are followed by an open floor discussion where audience members and presenters can fully interact. The results: you can make better, more informed decisions.

## AMERICANS WITH DISABILITIES ACT

The International Water Conference® and ESWP supports the Americans with Disabilities Act (ADA), which prohibits discrimination against, and promotes public accessibility for those with disabilities. Please see the IWC Staff at the Conference Registration Desk for assistance in providing specific equipment or services.

## PROFESSIONAL DEVELOPMENT HOURS

IWC is a Florida Board of Professional Engineers Continuing Education Provider. Earn up to 25 Professional Development Hours. Please complete the form provided in your registration packet at the conference.

## ORLANDO ATTRACTIONS

Besides being the obvious theme park destination, Orlando has plenty of activities to enjoy. Visitors can shop at one of Orlando's many outlet centers, themed shopping villages, or eight regional malls. For a cultural experience, guests can visit an area art or history museum or enjoy a performance at one of the numerous performing arts venues in the area. Sports lovers will enjoy the 168 golf courses, 800 tennis courts and 2,000 lakes for swimming, fishing, boating and water skiing. Orlando offers a wide variety of themed restaurants and dinner theaters. Visitors will also enjoy the diverse nightlife at downtown Orlando or at the many clubs near the attractions. For more information visit the Information table near the Registration Desk.

## GOLFING

Captain's Choice Golf Services ([www.oflgolf.com](http://www.oflgolf.com)) is Orlando's premier golf concierge service, and is conveniently located in the Hilton at Walt Disney World® Resort, host hotel of the IWC. Captain's Choice can make tee time arrangements for as many (or few) golfers with 20 of the areas best private and public golf courses. Also, Captain's Choice will provide complimentary transportation for 2 or more players to and from the course, and can help with lunch or dinner options as well. Their on-site pro-shop is stocked with various golf gear, and rentals of clubs and shoes is available. To discuss your options, please stop by the Captain's Choice Golf Services site in the Hilton Hotel lobby.

# GENERAL INFORMATION

## FUN RUN

Come join us for the 21st annual IWC Fun Run in Orlando. This event, sponsored by ResinTech, is open to all runners and walkers attending the conference. Being held outside of Pittsburgh, we won't have to contend with any snow, sleet, or freezing temperatures. Just sun and fun! Please check the registration desk for more information. T-shirts will be awarded to all participants.

Start Time: Tuesday morning, Oct. 23 at 7am sharp; meet in the Hilton Hotel lobby at 6:45am

Place: The Hilton in the Walt Disney World® Resort

Distance: 3 miles – flat and easy course

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- **Veolia Water Solutions & Technologies**

## FUTURE DATES

Mark your calendar now for the 69th Annual International Water Conference, October 26-29, 2008 at the Crowne Plaza Hotel in San Antonio, Texas, along the famous River Walk. Visit [www.crowneplaza.com/sariverwalk](http://www.crowneplaza.com/sariverwalk) for details.

## WEB SITE

To keep up to date on all things related to the International Water Conference, visit our website at [www.eswp.com/water](http://www.eswp.com/water).

## IWC Executive Committee

The International Water Conference® (IWC) is sponsored by the Engineers' Society of Western Pennsylvania (ESWP), a membership based, not-for-profit organization, located in Pittsburgh, PA. Learn more at [www.eswp.com](http://www.eswp.com). The IWC is planned through the volunteer efforts of these top industry professionals who make up the IWC Executive Committee and IWC Advisory Council Company representatives.

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## IWC Advisory Council

The IWC Advisory Council is comprised of a group of companies that provide ongoing support for the planning of a successful conference. Membership is open to companies that have an interest in industrial water treatment and are willing to make a commitment to participate in several planning meetings thru the year to plan the IWC.

For more information about the IWC, see any member of the IWC Executive Committee or contact the IWC offices. The IWC is sponsored by the Engineers' Society of Western Pennsylvania, contact Tracy Devlin at 412-261-0710, or by e-mail at t.devlin@eswp.com.

### *IWC Advisory Council Companies as of October, 2007*

<b>AMBI-Design, Inc.</b> Shan Sundaram, P.E.	<b>GE Water &amp; Process Technologies</b> Robert Taylor
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# MONDAY TECHNICAL SESSIONS

## APPROACHES TO MINIMIZING MEMBRANE FOULING

**8:00-11:00am**

**SALON III**

This session focuses on membranes and the prevention of membrane fouling using various techniques. The presentations provided in this session deliver unique and interesting alternatives to conventional treatments for minimizing membrane fouling. Subjects of interest include alternative membrane types, high-efficiency filtration as an alternative to depth filtration, and evaluation of feed-spacer thickness in relation to RO membrane fouling.

**Session Chair:** Jane Kucera, Nalco Company, Naperville, IL  
**IWC Representative:** Wayne Bernahl, W. Bernahl Enterprises Ltd., Elmhurst, IL  
**Discussion Leader:** Jantje Johnson, Genesys North America, Eden Prairie, MN

**PAPER: 07-03**

**8:00AM**

### Synthesis and Characterization of Charged Polystyrene Membranes for the Electrodialysis of Sodium Chloride Using Space Charge Model

Anil Kumar; Sonny Sachdeva, Indian Institute of Technology, Kanpur, India

We have prepared a crosslinked polystyrene anion exchange composite membrane for the electrolysis of sodium chloride to produce sodium hydroxide by selective removal of chloride ions. The composite membrane is homogeneously modified by gas phase nitration, followed by amination using hydrazine hydrate and further reaction with dichloroethane and triethylamine to introduce quaternary ammonium charges on it. We showed that the membrane is specific to the transport of chloride ions through its pores. The performance of the membrane has been evaluated in terms of current efficiency and power consumption which were obtained to be 96.5 % and 0.1216 kWh/mol, respectively. The two dimensional Space charge model in cylindrical coordinates has been solved semi analytically to obtain the effective wall potential and pore size that characterize the membrane and are difficult to measure directly. The experimentally obtained solute flux and current density have been fitted to the model and optimum values of effective wall potential and pore diameter have been determined to be 0.4nm and 80 mV, respectively.

**8:25am Discusser:** Jonathan Wood, Siemens Water Technologies, Lowell, MA

**8:35am Closure & Floor Discussion**

**REPORT: 07-04**

**8:50AM**

### High-Efficiency Filtration for Reverse Osmosis Pretreatment

Jason P. Fues; Jane Kucera, Nalco Company, Naperville, IL

Reverse Osmosis (RO) has become a common method to demineralize water. A successful RO system requires not only a good design but also appropriate pretreatment to minimize fouling of the membranes with suspended solids. We investigated using high-efficiency filters as pretreatment to RO systems to remove suspended solids and minimize fouling of the RO membranes. These filters have the ability to remove particles down to 0.25-microns in size. This report describes various aspects and specific applications of this technology.

**9:10am Closure & Floor Discussion**

**PAPER: 07-05**

**9:20AM**

## **Side-by-Side Performance of Reverse Osmosis Elements Using Two Different Feed Channel Spacers**

**Scott Beardsley; Craig Granlund, The Dow Chemical Company, Edina, MN**

This paper will evaluate the performance of two different 400 square foot 8-inch reverse osmosis elements from the same membrane manufacturer operating side by side on a city water supply taken from a surface water source. The reverse osmosis system is operated at a Midwest generating station that supplies electricity and steam to area businesses, industry and homes in a city in eastern Iowa. The side by side reverse osmosis trains are each designed to produce 400 gallons per minute of product water or permeate at 80 percent recovery, and have been operating with the different 400 square foot elements, installed at the same time, for two years. The 400 square foot reverse osmosis elements contain different feed channel spacers, which provide turbulent flow against the membrane surface. The purpose of the feed channel spacer is to help prevent fouling and concentration polarization. It has been frequently conjectured that wider feed spacers enable more turbulence and more effective cleaning, so this paper will look at the performance data of the 34-mil spacer in one train compared to the 28-mil spacer in the side by side train over a period of two years. The operating data shows that there is a lower pressure drop and slightly lower overall feed pressure with the 400 square foot element constructed with the wider 34-mil feed spacer.

**9:45am Discusser: Michael Preston, Black & Veatch, Overland Park, KS**

**9:55am Closure & Floor Discussion**

**10:10am Coffee Break; Ballroom Foyer**

# MONDAY TECHNICAL SESSIONS

## WATER, WASTEWATER & BIOLOGICAL TREATMENT

**8:00-11:00am**

**SALON I**

This technical session presents advanced treatment concepts for wastewater for pulp and paper industry using Suspended Carrier Biofilm Process (SCBP), removal of ammonia using Advanced Flow Membrane Aerated Biofilm Reactors, and advanced hydrodynamic cavitation technology for precipitating calcium

- Session Chair:** Kar Munirathinam; Ph.D.; N.A. Water Systems, Moon Township, PA
- IWC Representative:** Paul Puckorius, Puckorius & Associates, Inc., Arvada, CO
- Discussion Leader:** Anthony Selby, Mechanical & Material Engineering, Evergreen, CO

**REPORT: 07-06**

**8:00AM**

### Enhanced Calcium Removal from Electronics Wastewater with Hydrodynamic Cavitation Technology

Sun-Jip Kim; Jin-Young Park; Won-Kwon Lee, G&G Co., Ltd., Suwon, Korea; Yong-Woo Lee; Jae-Jin Lee, Samsung Engineering Co., Ltd., Seoul, Korea; Kyu-Won Hwang, Samsung Electronics Co., Ltd., Hwasung, Korea; and Wiley Wang, VRTX Technologies Co., LLC, Schertz, TX

This report presents the test results on enhanced calcium removal from the effluent of a fluoride removal process in electronics manufacturing industry with a patented hydrodynamic cavitation device. Compared to the conventional soda-ash process, this new process requires less sodium carbonate dose and yields higher calcium removal.

8:20am Closure & Floor Discussion

**PAPER: 07-07**

**8:30AM**

### Treatment Efficiency Increase of Existing Pulp And Paper Industry Wastewater Treatment Plants With Suspended Carrier Biofilm Process (SCBP)

Ari Ketonen, Eimco Water Technologies, Salt Lake City, UT

Pulp and Paper mills generate large amounts of wastewaters, which have significant effects to the state of the recipient waters. For this reason all most all of the mills have their own wastewater treatment plants. Still today most of these treatment plants are based on traditional lagoon or activated sludge processes. Often the new stricter discharge limits set by the authorities, cannot be achieved with the existing treatment plants. Usually this would mean very expensive investments, if the upgrading would be done with the traditional technology. For these kinds of situations suspended carrier biofilm process (SCBP) offers an efficient and economical solution to increase the efficiency of the existing treatment plant. SCBP combines the benefits of the traditional activated sludge and biofilm processes, while avoiding their problems. In SCBP most of the biomass grows attached on the surface of specially designed plastic carrier material, which moves freely in the whole reactor volume. Main advantages of SCBP when compared to the conventional processes are: significantly higher loading, good resistance to quantity and quality fluctuations of inlet water, quick start-up time, good ability to handle toxic spills and low sludge production. This paper describes the fundamentals of the SCBP. Emphasis is on the upgrade of the existing activated sludge processes although SCBP can be used alone to

## MONDAY TECHNICAL SESSIONS

cover the whole wastewater treatment. Results of a pilot-scale SCBP study as well as the operating results from some actual full scale treatment plants are presented.

**8:55am Discusser:** Paul Togna, Shaw Environmental & Infrastructure, Lawrenceville, NJ

**9:05am Closure & Floor Discussion**

### **PAPER: 07-08**

**9:20AM**

#### **Application of Advective-Flow Membrane-Aerated Biofilm Reactor (AFMABR) for Treatment of Ammonium-Rich Wastewater**

**Ali R. Ahmadi Motlagh; Jabin Joseph; Timothy M. Lapara; Michael J. Semmens, University of Minnesota, Minneapolis, MN**

A novel membrane aerated biofilm reactor (MABR) configuration was tested by pumping wastewater across the biofilm-covered membrane fabric to increase the delivery rate of nutrients to the biofilm. Using ammonium-rich synthetic wastewater, removal rates as high as 8-10 gN/m<sup>2</sup>biofilm-d were achieved, showing an improvement over conventional MABRs.

**9:45am Discusser:** Enos L. Stover, PhD, The Stover Group, Stillwater, OK

**9:55am Closure & Floor Discussion**

### **REPORT: 07-02**

**10:10AM**

#### **Application of Activated Carbon Technologies in Supplemental Point-of-use (POU) and Point-of-entry (POE) Drinking Water Treatment**

**Dr. Gary L. Hatch; Tara Koele, Pentair Filtration, Inc., Sheboygan, WI**

Historical records indicate that activated carbon (AC - "charcoal") has been utilized for improving the aesthetic quality (taste, odor, clarity) of water for several thousand years. With the advent of sophisticated analytical equipment during the 20th century it was possible to demonstrate that AC is also capable of removing many health-related contaminants from drinking water. Today AC is utilized by treatment plants in the initial drinking water treatment process as pretreatment for removing disinfection by-product precursors either by biological activated carbon (BAC) or by direct adsorption. However, AC is also used at the other end of the water distribution system at the entry to the home (POE) and at the end of the tap (POU). Many different types and forms of AC are utilized in POE and POU products that not only make the water taste better but also make it safer to drink. Test data will be presented to demonstrate how effective these technologies can be for removing chlorine, chloramine, organics (VOC's, pesticides, etc.), lead, arsenic and microbial contaminants such as protozoan cysts and oocysts (e.g., *Giardia lamblia* and *Cryptosporidium parvum*), bacteria and viruses.

**10:30am Closure & Floor Discussion**

**10:45am Coffee Break, Ballroom Foyer**

# MONDAY TECHNICAL SESSIONS

## ZERO LIQUID DISCHARGE TECHNIQUES AND APPLICATIONS

**8:00 -1 1:00am**

**SALON II**

This session will examine zero liquid discharge inspired technologies in overall plant and specific unit applications.

**Session Chair:** Dennis McBride, Fluor Power, Greenville, SC

**IWC Representative:** Bradley Wolf; P.E., Navigant Consulting, Pittsburgh, PA

**Discussion Leader:** Brian Heimbigner, Siemens Water Technologies Corp., Warrendale, PA

**PAPER: 07-09**

**8:00AM**

### Achieving Zero Blowdown for Cooling Towers

**Sam Owens; Rick Maxey, CHEMICO International, Inc., Corpus Christi, TX**

A new chemistry approach provides water savings in hard, alkaline cooling waters. Hardness and silica are removed as a semi-viscous fluid. This economical treatment program reclaims over 95% of open circulation cooling tower water blowdown. Significantly reduced make-up and wastewater treatment costs often make this the preferred treatment program.

**8:25am Discusser:** William Shaw, P.E., HPD, LLC, Pewaukee, WI

**8:35am Closure & Floor Discussion**

**PAPER: 07-10**

**8:50AM**

### Zero Liquid Discharge System Based On Advanced Technologies In A Chemical Plant

**Ajanta Sarkar, Aquatech Systems (Asia) Pvt. Limited, Pune, Maharashtra, India**

A leading industrial house in the south of India has a facility producing multiple waste streams with major contaminants like Oil & Grease, volatile organic compounds and high dissolved solids levels with potentially high variation in constituents. The waste streams also have a relatively high COD. It was decided to reuse this effluent after appropriate treatment for cooling tower make-up and also at the same time to explore the possibility of achieving zero liquid discharge status. The solution provided uses an advanced Reverse Osmosis technology which is particularly advantageous in waste water recycle applications, followed by a MVC based ZLD system.

**9:15am Discusser:** Jim Moen, Roseville Electric, Roseville, CA

**9:25am Closure & Floor Discussion**

**REPORT: 07-11**

**9:40AM**

### ZLD: New Silica Based Inhibitor Chemistry Permits Cost Effective Water Conservation for HVAC and Industrial Cooling Towers

**Dan Duke, Water Conservation Technology International, Inc., Temecula, CA**

ZLD approaches for cooling towers have existed for decades, but capital and operating cost generally made them impractical. New "green" chemistry now makes ZLD operation highly economical from 50 ton HVAC to heavy industrial towers. The inhibitor chemistry is ideal for source waters with high hardness, silica, chloride, TDS and organics.

**10:00am Closure & Floor Discussion**

**10:30am Coffee Break, Ballroom Foyer**

# MONDAY TECHNICAL SESSIONS

## AWARDS & KEYNOTE SESSION

**11:00am - 12noon**

**INT'L. BALLROOM**

**Keynote Speaker:** Dr. William H. Joyce, CEO, Nalco Company, Naperville, IL

Environmental sustainability is increasingly driving companies to focus attention on resource conservation. Done properly, resource conservation also improves each company's economic sustainability. Improved control precision in water treatment enables industry to reduce energy use and associated greenhouse gases. That precision also improves the capability to recycle water, protecting often scarce surface water or groundwater resources. Whether a Company's motivation is economic or environmental, the right long-term answers remain the same.

Dr. William H. Joyce has been the Chairman of the Board and Chief Executive Officer of Nalco Company since November 2003. Dr. Joyce was formerly the Chairman and Chief Executive Officer of Hercules Incorporated, a position he took in May 2001. Dr. Joyce was Chairman, President and Chief Executive Officer of Union Carbide Corporation from 1996 through May 2001. From 1995 to 1996, Dr. Joyce was President and Chief Executive Officer, and from 1993 to 1995 he was President of Union Carbide. Prior to that, he had been Chief Operating Officer of Union Carbide since 1992. Dr. Joyce holds a B.S. degree in Chemical Engineering from Penn State University, and M.B.A. and Ph.D. degrees from New York University. He received the National Medal of Technology Award in 1993 from President Clinton, the Plastics Academy's Industry Achievement Award in 1994 and Lifetime Achievement Award in 1997. In 1997, he was inducted into the National Academy of Engineering. In 2003, Dr. Joyce received the Society of Chemical Industry Perkin Medal Award. Dr. Joyce is a director of CVS/Caremark Corporation, El Paso Corporation and the American Chemistry Council. He is a trustee of the Universities Research Association, Inc. Dr. Joyce has served as Chairman of the Board of the Society of Plastics Industry and as Co-Chairman of the Government-University-Industry Research Roundtable of the National Academies.

### MERIT AWARD

Each year, the International Water Conference® presents the Annual Merit Award to honor outstanding individuals in the field of industrial water technology. This year's Merit Awardee is Michael C. Gottlieb.

### PAUL COHEN AWARD

As a memorial to Paul Cohen and his contributions to the power generation industry, the IWC is proud to recognize the authors of the most precise and innovative presentation in the field of power systems water technology that was presented at the 67th Luis Carvalho Paper: IWC-06-30 Is Cation Conductivity Monitoring Relevant For Today's Combined Cycle Power Plant

### JOSEPH A. LEVENDUSKY MEMORIAL SCHOLARSHIP

Epicor, Incorporated, in cooperation with the International Water Conference®, will present the 2007 Joseph A. Levendusky Scholarship during the opening session to two recipients: Nolan G. Southard; University of Maine - Mechanical Engineering (Sophomore) and Benjamin D. Hoff; University of Toledo - College of Engineering - Chemical Engineering (Junior). Each one of the recipients will receive \$ 1,250 per semester or \$2,500 per school season (Spring / Fall).

### N.A. WATER SCHOLARSHIP

Congratulations to Andrew Michael Corris, winner of this year's scholarship, from the University of Pittsburgh.

# MONDAY TECHNICAL SESSIONS

## IMPROVING PERFORMANCE OF STEAM ELECTRIC GENERATING PLANTS

**2:00 - 5:00pm**

**SALON III**

The presentations in this session are all related in some fashion to improving the overall performance of steam-electric generating power plants. The subjects covered include cycle chemistry requirements for start-up and commissioning of supercritical once-through boilers, a new design of CEDI for use in polishing high-pressure condensate returns, micro-media filtration, RO and compressed-bed ion exchange for pretreatment of a tertiary water source, and minimization of water usage and waste water flow from coal-fired power plants. These processes can all be helpful in upgrading most any steam generating plant for improved performance and efficiency.

Session Chair:	Douglas Dewitt-Dick, Ashland, Inc., Portland, TX
IWC Representative:	David Simon, Cyrus Rice Water Consultants, Pittsburgh, PA
Discussion Leader:	Dennis McBride, Fluor Corporation, Greenville, SC

**PAPER: 07-12**

**2:00PM**

### Increased Water Treatment Plant Capacity at a Mexican Power Station Using Micro Media Filters Ahead of RO and Replacing EDI with Ion Exchange

Rusi Kapadia; Michael Sheedy; Donald Swaine, Eco-Tec Inc., Pickering, Ontario, Canada; and Patricia M. Scroggin, Burns & McDonnell, Kansas City, Missouri

This paper describes the system used to treat a Mexican tertiary water source to produce boiler makeup. A micro media filter provides RO feed with turbidity of < 0.2 NTU and SDI < 5. The compressed bed demineralizer after the RO produces water with a conductivity of < 0.06  $\mu\text{S}/\text{cm}$ .

2:25pm Discusser: Arun Mittal, Aquatech International Corporation, Canonsburg, PA

2:35pm Closure & Floor Discussion

**PAPER: 07-13**

**2:50PM**

### Controlling Chemistry during Startup and Commissioning of Once-Through Supercritical Boilers: An Overview from the EPC Contractor's Perspective

Kathi Kirschenheiter; Michael Chuk; Colleen Layman; Kumar Sinha, Bechtel Power Corporation, Frederick, MD

With new power plants committing to once-through supercritical boilers and the rush to put them online with the shortest schedule possible, any EPC contractor with turn-key responsibilities faces a dilemma with respect to both short-term and long-term chemistry concerns. This dilemma is related to Oxygenated Treatment (OT) that will be implemented on these boilers during long-term normal operation. Whereas most of the industry experience is based on converting existing once-through boilers from All Volatile Treatment (AVT) to OT, there is relatively much less information on newer boilers operating on OT. EPRI startup guidelines provided for AVT(O) (All Volatile Treatment (Oxidizing)) and AVT(R) (All Volatile Treatment (Reducing)) to facilitate conversion to OT for these boilers are sound but not tested on new boilers. Additional

# MONDAY TECHNICAL SESSIONS

considerations such as “No Deaerators Cycles” are not included and must be treated on a case-per-case basis. The startup/commissioning cycle is still the EPC turn-key contractor’s responsibility, which includes startup on AVT and quick conversion to OT. This technical paper addresses these chemistry issues and provides a practical approach to achieving steam purity and the specified feedwater chemistry requirements.

**3:15pm Discusser:** Bob Bartholomew, Sheppard T. Powell Associates, LLC, Baltimore, MD

**3:25pm Closure & Floor Discussion**

**3:40pm Coffee Break, Ballroom Foyer**

**PAPER: 07-14**

**4:00PM**

## Treatment Of Wastewaters From Coal-Fired Power Plants

**William Shaw; P.E.**, HPD, LLC, a Veolia Water Solutions & Technologies, Pewaukee, WI

In all coal-fired power plants the current and future trends are water conservation and minimizing the quantity of effluents discharged from the plant. This paper describes the various types of effluent streams generated in both PC and IGCC plants, typical pollutants they contain, and the treatment technologies and systems most commonly used to meet regulated discharge limits. It also describes methods of minimizing water usage and discharge, including achieving zero liquid discharge.

**4:25pm Discusser:** Lanny Weimer, GE Water & Process Technologies, Ellicott City, MD

**4:35pm Closure & Floor Discussion**

## ION EXCHANGE SPECIAL APPLICATIONS

**2:00 - 5:30pm**

**SALON II**

Ion exchange resins can be used for purposes well beyond the demineralization of water. Basic resin properties can be adjusted to provide unique performance in water based applications ranging from disinfection to selective metal removal from ground water. This session will be useful to people interested in specialty ion exchange materials and professionals looking to expand their knowledge of unique water treatment applications.

**Session Chair:** Michael Sheedy, Eco-Tec Inc., Pickering, ON, Canada

**IWC Representative:** Craig Brown, Chemionex, Pickering, ON, Canada

**Discussion Leader:** Dan Rice, Dow Chemical Company, Midland, MI

**PAPER: 07-15**

**2:00PM**

## Selective Ion Exchange Resins and Their Application for Target Contaminant Removal in Aqueous Systems

**Stefan Neumann**, Lanxess, Leverkusen, Germany; and **Michael Keller**, Sybron Chemicals Inc, a Lanxess Company

Selective ion exchange resins are used to remove trace contaminants from a variety of aqueous sources, from waste to drinking water. The presentation describes the chemistry of the various selective ion exchange resins and provides an overview of the technically approved examples. Contaminants of interest include heavy metals as copper, nickel, mercury, lead, cadmium, zinc as



## MONDAY TECHNICAL SESSIONS

well as toxic anions like cyanides, chromates, anionic detergents, borate, arsenate, and perchlorate. Organic components such as amines, phenols, halogenated hydrocarbons and others are included.

2:25pm Discusser: Sergio Mijares, Thermax USA, Novi, MI

2:35pm Closure & Floor Discussion

### PAPER: 07-16

2:50PM

#### Structural Design of Nanoporous Silica Polyamine Composites for Metal Separations and Processing in Water

Edward Rosenberg; Mark Hughes; Jessica Ward, Department of Chemistry, University of Montana, Missoula, MT

Over the past ten years research at the University of Montana in collaboration with Purity Systems Inc, both located in Missoula, Montana, has resulted in a novel class of chelator materials composed of amorphous, nanoporous silica gels and modified polyamines. These materials offer some distinct advantages over conventional polystyrene based resins especially for applications in the mining industry. This paper will report on the relationship between polymer structure and metal selectivity, the relationship between chelator structure and metal selectivity and further comparisons with polystyrene analogs.

3:15pm Discusser: Dr. Robert Albright, Albright Consulting, Churchville, PA

3:25 pm Closure & Floor Discussion

3:40pm Coffee Break, Ballroom Foyer

### PAPER: 07-17

3:50PM

#### Evaluation of Tri-bromide Resin for Bacterial Purification of Drinking Water

Shirish Naik; S.V.Mokashi; Sujata Kulkarni; Kiran Deshpande, Thermax Ltd, Chemical Division, Bhosari, Pune, India

Strongly basic anion-exchange resins are Brominated using bromine and used as disinfectants for drinking water. The synthesis method comprises of hazards liquid like Bromine. Hence to avoid the handling bromine we have developed a In-situ bromination of strong base anion exchange resin, which is tested for the microbial activity and bromine leaching trend.

4:15pm Discusser: Greg Vero, Orica Watercare, Watkins, CO

4:25pm Closure & Floor Discussion

### PAPER: 07-18

4:40PM

#### Ion Exchange Resins as Stationary Phase in Industrial Chromatographic Applications

Heikki Mononen, Finex Oy (Inc), Kotka, Finland

Since 1980's tailor-made ion exchange resins are widely used in large scale chromatographic separation systems as stationary phase. Separation systems utilize different ion exchange resins' properties depending on application. Wide variety of various resin parameters can be modified and tailor-made according to application. Fundamental scientific principles for ligand chromatography, ion exclusion, size exclusion and acid retardation are explained followed by practical examples from industry.

5:05pm Discusser: Dr. Gordon J. Rossiter, IXSEP, Houston, TX

5:15pm Closure & Floor Discussion

# MONDAY TECHNICAL SESSIONS

## LEGIONELLA PANEL DISCUSSION

**2:00 - 5:00pm**

**INT'L. BALLROOM**

Legionella in Cooling Water systems will be reviewed in this session along with new developments in testing and a review of recent case histories on outbreaks of the disease. A panel discussion by experts in the field will follow the papers which will provide an opportunity to ask questions on guidelines for control and findings of outbreaks in water systems.

**Session Chair:** Arthur Freedman, Arthur Freedman & Associates, Inc., East Stroudsburg, PA  
**IWC Representative:** Paul Puckorius, Puckorius & Associates, Inc., Arvada, CO  
**Discussion Leader:** David Alley, Clearwater Systems Corp., Essex, CT

**REPORT: 07-19**

**2:00PM**

### Use of iQ-Check™ Legionella Kits as a New Tool for Efficient Legionella Monitoring in Cooling Towers and Potable Water

Veliana Todorova; Hélène Frenkiel-Lebossé; Sophie Pierre; Frédéric Martinez, Bio-Rad, Marnes-la-Coquette, France

To provide water-testing laboratories with a fast and reliable method for the quantification of Legionella, Bio-Rad has developed four kits based on real-time PCR for the detection and quantification of Legionella spp and L. pneumophila bacteria in water samples. Legionella species are detected by amplifying a specific 5S RNA DNA sequence and mip gene is used of L. pneumophila detection. iQ-Check™ kits contain all reagents required for the assay, including calibrated DNA standards from L. pneumophila ATCC 33152.

2:20pm Closure & Floor Discussion

**PAPER: 07-20**

**2:30PM**

### An Overview of Legionella Analysis

Diane Miskowski, EMSL Analytical Inc., Westmont, NJ

Many private, commercial, and state health department laboratories currently test for Legionella but not all analytical methods are created equally. This presentation is an overview of the different types of analyses currently available for correctly determining the presence of Legionellaceae, identifying and enumerating the specific species of Legionella bacteria, and identifying the strains that exist within a species. Clarification will be provided for determining what level of information is warranted. The proper sampling procedures, variety of tests available, their inherent advantages and disadvantages, and how that information can be used will be discussed.

2:55pm Discusser:

3:05pm Closure & Floor Discussion

3:20pm Coffee Break, Ballroom Foyer

# MONDAY TECHNICAL SESSIONS

**PAPER: 07-21**

**3:30PM**

## **Cutting-edge Technology for Legionella Identification & Control in Cooling and Drinking Water**

**Zhe Zhang; Ph.D.; William J. Kokolis**, San Air Technologies Laboratory, Inc., Powhatan, VA; **and Paul Puckorius**, Puckorius & Associates, Arvada, CO

This paper is an overview of the newest technology now being employed in Legionella identification in cooling and drinking water. A dual approach offers the gold standard science of Culture supplemented with the new application of DNA Sequencing. The focus will be two-fold: defining the need for Legionella testing and the advantages of DNA Sequencing as part of the testing protocol and review of Legionella control technologies in cooling and drinking water.

**4:05pm Discusser**

**4:15pm Closure & Floor Discussion**

**4:30pm PANEL DISCUSSION; George Licina**, Structural Integrity Associates, Inc., San Jose, CA, **Janet Stout, Ph.D.**, Special Pathogens Laboratory, Inc., Pittsburgh, PA & **Presenting Authors**

## TUESDAY TECHNICAL SESSIONS

### BLOWDOWN RECYCLE AND EQUIPMENT DESIGN CONSIDERATION FOR PRODUCED WATER

**8:00am - 12noon**

**SALON I**

The papers in this session will discuss most current challenges dealing with wastewater minimization and critical equipment design considerations for produced water in the heavy oil extraction.

- Session Chair: **Rafael Gay-de-Montella**, Colt Engineering, Calgary, AB, Canada
- IWC Representative: **Manoj Sharma**, Aquatech International Corp., Canonsburg, PA
- Discussion Leader: **Michael Bridle**, WorleyParsons MEG, Calgary, AB, Canada

**PAPER: 07-24**

**8:00AM**

#### Equipment Design Considerations for Lime Softening and Ion Exchange Softening of Produced Water in Heavy Oil Extraction

**Robert Holloway**, Holloway Associates, Etobicoke, ON, Canada; and **Gordon Page**, Page Technology Ltd., Calgary, AB, Canada

Produced water is commonly treated by lime softening / ion exchange for use as feedwater. Tar sands projects are costly and cost control and sales competition can result in process misapplication or installation of under designed and underperforming equipment. Unplanned shutdowns and production losses can result. The risks can be minimized by good engineering decisions.

8:25am Discusser: **John Fair**; P. Eng., Fair Canada Engineering Ltd., Calgary, AB, Canada

8:35am Closure & Floor Discussion

**PAPER: 07-25**

**8:50AM**

#### Water Reuse Plant Challenges for Alternative SAGD Steam Generation

**Rowena Penaranda**; **Rafael Gay-de-Montella**, Colt Engineering Corporation, Calgary, AB, Canada

SAGD projects in Alberta have generally been designed to utilize the Once Through Steam Generator for the production of steam. Alternative steam generating systems for use in the SAGD process are likely to provide economic and operating benefits. With each boiler type, the sensitivity to impurities in the water changes, thus the water treatment will also need to change.

9:15am Discusser: **Caroline Wilson-Mussbacher**, Encana, Calgary, AB, Canada

9:25am Closure & Floor Discussion

9:40am Coffee Break, Ballroom Foyer

**PAPER: 07-26**

**9:50AM**

#### OTSG Blowdown Treatment for a SAGD Oil Production Facility

**Steve Portelance**, WorleyParsons MEG, Calgary, AB, Canada

This paper evaluates two Once Through Steam Generator (OTSG) blowdown treatment strategies for Steam Assisted Gravity Drainage (SAGD) oil production facilities in order to increase

## TUESDAY TECHNICAL SESSIONS

blowdown recycle and eliminate deep well disposal and achieve Zero Liquid Discharge.

10:15am Discusser: **Karen Kwasniewski**, Encana, Calgary, AB, Canada

10:25am Closure & Floor Discussion

**REPORT: 07-27**

**10:40AM**

### **Affect and Challenge of Controlling Multiple Feed Streams (Brackish, Fresh, and Produced Waters) to Inlet of a Warm Lime Softener**

**Melonie Myszczyzyn**, Canadian Natural Resources Limited, Bonnyville, AB, Canada

This report will provide an overview of the warm lime softening system in operation at the CNRL Wolf Lake Facility. In addition, will discuss the affect and operational challenges of introducing blends of brackish, fresh, and produced water streams as feed to the warm lime softener.

11:10am Closure & Floor Discussion

### **EXPERIENCES ASSOCIATED WITH EXTENDED LAY-UPS OF STEAM GENERATION SYSTEMS AND SUBSEQUENT RETURN TO SERVICE-- PANEL DISCUSSION SPONSORED BY ASME RESEARCH COMMITTEE**

**8:00am - 12noon**

**INT'L. BALLROOM**

This session will consist of at least four panelist reports on the title subject followed by a free-wheeling Q&A session between the audience and the panel members to obtain expert answers to practical problems. Following an introductory description of the general theme, other panelists will present information on a novel approach to storing and returning feedwater heaters to service, declining pressure method for boiler storage, and lay-up and return-to-service practices at Ontario Power Generation. At least two other expert panelists are expected to participate with specific subjects of their choice. This wealth of information from the panelists should elicit a stimulating and useful floor discussion.

Session Chair: **Edward (Ted) Beardwood**, Ashland Chemical Drew Division, Ajax, Ontario, Canada

IWC Representative: **David Simon**, Cyrus Rice Water Consultants, Pittsburgh, PA

**REPORT: 07-28**

**8:00AM**

### **I Have To Lay Boilers Up – What Next?**

**James Dromgoole**, Fort Bend Services, Inc., Stafford, TX

The paper will discuss lay-up procedures for different lengths of time, for various boiler sizes, design and pressures. Problems associated with boiler lay-up will also be discussed.

## TUESDAY TECHNICAL SESSIONS

**REPORT: 07-29**

**8:20AM**

### **A Novel Approach to Storing and Returning Feedwater Heater Shells to Service**

**Tom Pike**, Western Farmers Electric Co-operative, Fort Towson, OK; and **Richard Ashcraft**, Ashland Water Technologies, Savannah, TX

Feedwater heater shells are frequently left unprotected during unit shutdowns and outages. Even though means are generally available during outages to protect these critical areas, many plants either fail to protect the heater shells or, in some cases, opt to leave the shells exposed to damaging environments. Failure to protect heater shells, even during short outages, can exacerbate problems with metal oxide transport when returning the heaters to service – particularly if the heaters contain copper-bearing tubes. This paper investigates a novel approach used by one utility to circumvent problems with oxide transport due to inadequate heater shell storage. It discusses structural modifications incorporated by the plant to improve the storage process. It also details the proper chemistry and testing procedures necessary for shell protection under various conditions. Equally important, this paper outlines critical controls for minimizing copper oxide transport during subsequent unit startups.

**REPORT: 07-30**

**8:40AM**

### **Declining Pressure Method for Boiler Storage**

**Bill Stroman**, Primary Energy, San Diego, CA

Due to concerns with respect to boiler corrosion protection during idle periods while cycling for economics an effective storage method was developed. This approach avoided the use of high concentrations of storage treatment chemicals, required minimal man hours to implement and allowed for faster return to service and still meets the needs of the load dispatch control centre. The approach has been used successfully for shutdowns ranging from overnight to 40 days.

**REPORT: 07-31**

**9:00AM**

### **Lay-Up and Return to Service Practices at Ontario Power Generation**

**Michael Caravaggio**, Ontario Power Generation, ON, Canada

Ontario Power Generation (formerly Ontario Hydro) is a Provincially owned Utility that has provided better than 80% of the Province's electricity for the past 100 years. OPG's current mix of assets includes several peaking fossil fuel plants (primarily coal fired drum units). This paper reviews the current practices for short and medium term lay-up of these peaking units. It includes the key return to service parameters and practices used at OPG, and reviews the relative performance of the units following these practices. The paper focuses on the water chemistry aspects of the lay-up and return to service, in particular chemical parameter monitoring and chemical dosing practices in addition to the use of chemical control equipment such as polishers. The paper focuses on two-shifting, weekend outage turnarounds, and planned maintenance outage turnarounds, but it also covers indefinite length non-maintenance outages which can last up to several months.

**9:20am Coffee Break, Ballroom Foyer**

## TUESDAY TECHNICAL SESSIONS

**REPORT: 07-32**

**9:30AM**

### **Do EPRI and ASME Guidelines Apply to Me?**

**William Moore**, Calpine Corporation, Houston, TX

Experiences from several plants compared to currently available guidelines will be discussed. The inability to achieve acceptable TOC values coming out of lay-up with the use of amines for pH buffering and the presence of oxygen scavenger at 200 ppb within the HRSG. Illustration of iron throws upon start-up. Different oxygen scavenger chemistries result in different iron throw characteristics. The outcome associated with an eight-week suspension of oxygen scavenger/metal passivator feed. Conductivity, cation conductivity and pH results associated with the use of amine blends compared to ammonia.

**REPORT: 07-33**

**9:50AM**

### **Considerations in Returning a Moth Balled Unit to Service**

**Douglas DeWitt-Dick**, Ashland Water Technologies, Portland, TX; and **Carlos Benavides**; Topaz Energy

Many coal fired power plant boilers were mothballed over the past several years due to age and low cost alternative fuels. Recently, a significant rise in gas and oil prices has once again made coal fired units economically viable. This has resulted in numerous coal fired units being upgraded and removed from mothballing. Much planning must go into returning these units to operation. This paper details such considerations as are deemed necessary to achieve successful repowering and long term operation.

10:10am Panel Discussion

## **OPEN COOLING WATER SYSTEMS**

**8:00am - 12noon**

**SALON II**

The design and operation of open cooling systems can vary significantly due to a number of site-specific factors, such as makeup water quality and availability, changes in seasonal conditions, and environmental concerns. But all cooling system owners and operators share a common objective: reliable and cost-effective system performance. The presentations in this session use real-world experience to illustrate how certain site-specific factors can be addressed to assure desired system performance.

**Session Chair:** **Chris Brew**; P.E., Gainesville Regional Utilities, Gainesville, FL

**IWC Representative:** **Wayne Micheletti**, Wayne C. Micheletti, Inc., Charlottesville, VA

**Discussion Leader:** **Michael S. Dalton**, Ashland Water Technologies, Katy, TX

**PAPER: 07-34**

**8:00AM**

### **Benefits of Soft Water Makeup for Cooling Tower Operation**

**William Harfst**, Harfst and Associates, Inc., Crystal Lake, IL

Traditionally, cooling towers used in HVAC or process applications utilize raw water as the makeup source. Soft water is rarely recommended because it is generally considered to be more "corrosive" than untreated, hard water. This paper presents new information that suggests soft water offers several benefits over hard water in many cooling water applications. Specific data is presented from field applications in support of these claims.

**8:25am Discusser:** **James G. Kanuth**, ChemTreat, Inc., League City, TX

**8:35am Closure & Floor Discussion**

## TUESDAY TECHNICAL SESSIONS

**PAPER: 07-35**

**8:50AM**

### **Calcium Hypochlorite versus Bromine in Cooling Water Treatment**

**Stanley Pickens; Ph.D., PPG Industries, Inc., Monroeville, PA**

Calcium hypochlorite tablet feed systems offer an alternative option for cooling tower operators. Such tablet-erosion feed systems are recently being used even on some large industrial towers. The solid tablet form of the product offers safety and environmental and transport/storage advantages over liquid or gaseous halogen formulations. Hypochlorite tablets also have potential advantages versus bromine tablets in terms of cost, dissolve rates, impact on corrosion inhibitors and formation of disinfection by-products. Evidence shows that hypochlorite can be an effective sanitizer even in the pH 8-9 range, contrary to common misperceptions.

**9:15am Discusser: Farah Azarnia, Albemarle Corp., Baton Rouge, LA**

**9:25am: Closure & Floor Discussion**

**9:40am Coffee Break, Ballroom Foyer**

**PAPER: 07-36**

**9:50AM**

### **Cooling Tower Retrofit to a Once-Through Cooled Unit**

**Bruce A. Larkin; P.E., Black & Veatch, Overland Park, KS; and Susan Cinelli, The Board of Public Utilities, Kansas City, KS**

The once-through water supply to the Board of Public Utilities' (BPU's) Nearman Creek Plant has become less reliable because of drought and changing river hydraulic conditions. This paper describes the early indications of reliability issues and the emergency steps taken to keep the unit operable. Solutions were studied and implemented. Implementation included permitting, design, procurement, installation, startup, and (the happy ending) operation of a retrofitted cooling tower. The plant now has the ability to operate either in a once-through mode when river conditions allow or with the cooling tower.

**10:15am Discusser: James W. Cuchens; P.E., Southern Company Services, Inc, Birmingham, AL**

**10:25am Closure & Floor Discussion**

## **STATE OF THE ART FGD WASTEWATER TREATMENT TECHNOLOGIES AND DISCHARGE LIMITS**

**8:00am - 12noon**

**SALON III**

This technical session focuses on treatment of FGD purge wastewater streams. The technologies that have currently matured to deal with FGD purge water such as physical/chemical precipitation, evaporation, and disposal via constructed wetlands will be discussed. The papers selected for this session deal with both regulatory discharge limitations and zero liquid discharge (ZLD) requirements. Design challenges and technology process selection are explored with specific case histories.

**Session Chair: Robert Applegate, Graver Water Systems, Cranford NJ**

**IWC Representative: Kumar Sinha, Bechtel Power, Frederick, MD**

**Discussion Leader: Devesh Mittal, Aquatech International Corporation, Canonsburg, PA**



## TUESDAY TECHNICAL SESSIONS

**PAPER: 07-38**

**8:00AM**

### **Considerations Impacting the Technology Selection Process for FGD Purge Stream Wastewater Treatment Systems**

**Colleen A. Chapman; Colleen M. Layman, Bechtel Power Corporation, Frederick, MD**

With the more stringent air emissions standards that are being legislated in the US, both new and existing coal-fired power plants are installing flue gas desulfurization (FGD) systems. While reducing air-borne pollutants released from the plant, these systems create a wastewater stream that is challenging to handle because of its metals, organics, high chlorides, and high suspended solids content. As a result of the increased regulatory attention given to this waste stream and the complex treatment schemes associated with meeting the ever-tightening plant water discharge permit limits, this wastewater is a growing concern for many plant operators and designers. The targeted constituents that typically need to be addressed for treatment in FGD wastewater include heavy metals such as mercury, selenium, and arsenic as well as any organic compounds that are added to the FGD absorber to enhance SO<sub>2</sub> removal. Due to the high dissolved solids content of this wastewater stream, recycling this stream for reuse internally in the power plant, even after treatment for removal of metals and suspended solids has been performed, is normally quite difficult. Frequently the only options available for the ultimate disposal of this wastewater are discharge under regulatory purview and predicated conditions or crystallization in a zero liquid discharge system. This technical paper will examine the various treatments and reuse options available and discuss the issues influencing the design choices. Several case histories where FGD wastewater treatment systems have been designed for discharge of FGD wastewater and/or zero liquid discharge systems employed will be detailed.

**8:25am Discusser: Paul Chu, Electric Power Research Institute, Palo Alto, CA**

**8:35: Closure & Floor Discussion**

**PAPER: 07-37**

**8:50AM**

### **Designing Constructed Wetlands for Mitigating Risks from Flue Gas Desulfurization Wastewater**

**Cynthia Murray-Gulde; F. Douglas Mooney, ENTRIX, Inc. Atlanta, GA; and George M. Huddleston III; John H. Rogers, Jr.; Derek Eggert; Clemson University, Dept. of Forestry & Natural Resources, Clemson, SC**

Site-specific constructed wetland treatment systems have been designed and constructed to target removal of Se and Hg from FGD wastewater. The full-scale systems consist of an upstream equalization basin followed by three parallel surface-flow wetland treatment trains. Achieved start-up performance was approximately 57% for Se and 94 % for Hg.

**9:15am Discusser: Robert R. Wylie, Duke Energy, Charlotte, NC**

**9:25 Closure & Floor Discussion**

**9:40am Coffee Break, Ballroom Foyer**

## TUESDAY TECHNICAL SESSIONS

**PAPER: 07-39**

**9:50AM**

### **Evaporation of Purge Water from Wet FGD Scrubbers**

**Mark C. Nicholson; P.E., HPD, LLC, Plainfield, IL**

In the wet limestone FGD process, a purge stream is generally required to control the chloride concentration in the scrubber. This purge stream is typically acidic, highly saline, and contains variable amounts of suspended solids, metals, chloride, fluoride, organic compounds and other pollutants. Most commonly, the purge stream is treated using physical and chemical methods involving precipitation and settlement and discharged. Such treatment methods can reduce the suspended solids, acidity, and metals, but do not reduce the chloride or total dissolved solids. As discharge limits become more stringent, conventional treatment methods may not be able to reduce concentrations to the part per trillion levels required for discharge of some heavy metal ions. When conventional treatment methods are unable to treat FGD purge streams to produce an effluent which meets the requirements of the discharge permit, thermal evaporation of the purge stream should be considered.

**10:15am Discusser: Michael Preston, Black & Veatch, Overland Park, KS**

**10:25am Closure & Floor Discussion**

**PAPER: 07-40**

**10:40AM**

### **ZLD Solutions for the Treatment of FGD Wastewater**

**Greg Mandigo, Aquatech ICD, Hartland, WI; and Dick Schoen, Aquatech ICD, Hartland, WI**

Many challenges exist in the treatment of the wastewater from the flue gas desulfurization (FGD) process. These challenges include high concentrations of calcium, magnesium and chloride ions as well as large fluctuations in the FGD wastewater blowdown quantity and quality. Boron, ammonia and heavy metals are also typical impurities that must be overcome. Different types of ZLD processes have been developed that offer viable solutions to the growing problem of FGD wastewater treatment. This paper discusses and compares the chemistry considerations for several competing ZLD processes thus allowing for a better understanding of the issues involved and their impact on selection of the ZLD process.

**11:05am Discusser: Patricia Scroggin, Burns & McDonnell, Kansas City, MO**

**11:15am Closure & Floor Discussion**

# TUESDAY TECHNICAL SESSIONS

## ADVANCED MEMBRANE OPERATIONS AND APPLICATIONS

**2:00 - 5:00pm**

**SALON I**

Membrane processes are no longer new technology. However, they are now at a stage where new applications and innovations are perfecting and improving the use of membrane technologies. Papers in this session all describe improved or unique membrane processes and use.

- Session Chair:** Lawrence Krzesowski; P.E., GM Worldwide Facilities Group, Pontiac, MI
- IWC Representative:** Wayne Bernahl, W. Bernahl Enterprises Ltd., Elmhurst, IL
- Discussion Leader:** Steven Gagnon, AVANTech, Inc., Columbia, SC

**REPORT: 07-41**

**2:00PM**

### Commission Of A Water Treatment System In NZ

**Steven R. Gagnon, AVANTech, Inc., Columbia, SC**

This report will review the lessons learned in commissioning a water treatment system consisting of a dual stage horizontal filter, followed by a weak acid, strong acid, weak base, strong base and polishing mixed bed exchanger for a 300 MW peaking, open cycle power station in Napier, NZ. This report shall provide background on equipment design, water quality issues, system rework, operation problems and validation protocol.

2:20pm Closure & Floor Discussion

**PAPER: 07-42**

**2:30PM**

### EDI Performance and Resin Filled Concentrate Compartments

**John Barber; David F. Tessier; Ph.D., GE Infrastructure Water and Process Technologies, Guelph, ON, Canada**

This report describes a detailed investigation on the structure of the ion exchange resin in the concentrating compartments, in relation to both the hardness scaling properties and the deionization performance of an EDI stack. The behavior of three concentrate ion exchange resin structures are reported: pure cation resin, pure mixed-bed resin, and a novel arrangement comprising cation and mixed-bed resin domains.

2:55pm Discusser: **Jeff Tate, Agape Water Solutions, Inc., Harleysville, PA**

3:05pm Closure & Floor Discussion

3:20pm Coffee Break, Ballroom Foyer

**PAPER: 07-43**

**3:30PM**

### Pushing the Limits: Improved RO Membrane Cleaning Recommendations

**Craig Broden, Filmtec Corporation/Dow Chemical, Edina, MN**

Cleaning biofouling from reverse osmosis (RO) membranes is an important part of operating RO systems. A major factor in limiting the effectiveness of membrane cleanings is the pH of the cleaning solution. Many cleaning regimens specify acid cleaning followed by alkaline cleaning. The alkaline cleaning is typically performed in the pH range of 10.5 to 11.5. FilmTec Corporation lab tests and field experiences have shown that these procedures are not the most effective way to clean RO membranes. Experience with FILMTEC membranes has shown that the alkaline cleaning

## TUESDAY TECHNICAL SESSIONS

should precede the acid cleaning. Furthermore, the pH of the cleaning solution should be maintained in the pH range of 12 to 13 throughout the cleaning cycle. This paper discusses both lab tests and field experience of cleaning under these effective guidelines.

3:55pm Discusser: Tracy Barker, AVANTech, Inc., Oak Ridge, TN

4:05 Closure & Floor Discussion

### CLOSED COOLING WATER SYSTEMS

**2:00 - 5:00pm**

**SALON II**

This session will highlight the new technologies for closed loop water treatment including water conservation and monitoring.

Session Chair: John Kane, N.A. Water Systems, Moon Township, PA

IWC Representative: George Abraham, Veolia Water Solutions & Technologies, Moon Township, PA

Discussion Leader: Dan Duke, Water Conservation Technology International, Temecula, CA

**REPORT: 07-44**

**2:00PM**

#### Tracking Molybdenum Concentration in Cooling Water Applications

Vadim Malkov, Hach Company, Loveland, CO; and Blaine Nagao, ChemCal, Inc., Grapevine, TX

Newly developed Molybdenum process analyzers have been connected to the existing data acquisition system with web-based reporting component. The end-users have full access to both process and bench test results via the Internet. This on-line system has proven very useful for controlling cooling tower corrosion inhibition and Molybdate-containing reagents consumption.

2:20pm Closure & Floor Discussion

**REPORT: 07-45**

**2:30PM**

#### Water (Resource) Conservation Using Closed-Loop, Evaporative Cooling Systems for Process and Power Applications

Peter Demakos; P.E., Niagara Blower Co., Buffalo, NY

Closed-loop, evaporative cooling systems (Wet Surface Air Coolers) are a cost-effective heat transfer technology (for cooling and condensing) that also optimize use of scarce water resources. In addition to providing lower outlet temperatures and requiring less space and HP, the WSAC can use poor quality water as spray makeup.

2:50pm Closure & Floor Discussion

**REPORT: 07-46**

**3:00PM**

#### Case Histories of Using Tin Technology to Control Corrosion in Water Systems

William Stapp, AS Inc., Santa Rosa, CA; and Paul Puckorius, Puckorius and Associates, Evergreen, CO; and Clayton Wright, Park Central Office Complex, Denver, CO

This report looks at the results of a tin based corrosion control treatment program compared with results of a molybdate based treatment program. Tin is a relatively innocuous element environmentally. Tin has generally regarded as safe (GRAS) status with the USDA. Tin may be the best alternative for a green corrosion inhibitor.

3:20pm Closure & Floor Discussion

3:30pm Coffee Break, Ballroom Foyer

## TUESDAY TECHNICAL SESSIONS

**PAPER: 07-47**

**3:40PM**

### Review of Closed Loop Water Systems

Jay Farmerie, Cyrus Rice Water Consultants, Inc. Pittsburgh, PA; and Susan Rey, National Colloids, Steubenville, OH; and Gary Reggiani and the AWT Technical Committee, Eastern Technologies, Inc., Morgantown, PA

Since the enactment of regulations restricting the use of chromates, the treatment of closed loops has relied on the use of a select list of corrosion inhibitors. Treatment technologies available today with an emphasis on corrosion inhibitor selection, use and effectiveness in treating closed loops will be examined in this paper.

4:05pm Discussor: Shane Decoux, Air Liquide America, Houston, TX

4:15pm Closure & Floor Discussion

**PAPER: 07-48**

**4:30PM**

### Closed Cooling System Treatment: Using as an Alternative to Molybdate

Barbara Moriarty, Nalco, Naperville, IL

The paper will discuss the use of Phosphinosuccinate Oligomers (PSO) in closed loop cooling systems, as an alternative to molybdate.

4:55pm Discussor: John F. Zibrida, Zibex Inc., Duluth, GA

5:05pm Closure & Floor Discussion

## INDUSTRY EXPERIENCES WITH THE TREATMENT OF FLUE GAS DESULFURIZATION (FGD) PURGE WASTEWATER

**2:00 - 6:00pm**

**SALON III**

This session highlights experiences at power generating facilities with the treatment of FGD purge wastewater for disposal. Challenges encountered in the operation of full scale FGD wastewater treatment facilities and the results of pilot test studies utilizing biological systems, wetland systems, and physical/chemical treatment processes are presented and discussed.

Session Chair: Colleen Layman, P.E., Bechtel Power Corporation, Frederick, MD

IWC Representative: Mark Cheresnowsky, GE Water & Process Technologies, Gloucester, VA

Discussion Leader: Rick Szilagyi, Westech Engineering, Inc., Rockton, IL

**PAPER: 07-49**

**2:00PM**

### Biological Treatment of Flue Gas Desulfurization Scrubber Purge Water

Michael Pudvay, Degremont Technologies, Richmond, VA; and Robert Kelly; Antonio Lau, Degremont Technologies, Richmond, VA; and Enos Stover, Stover & Associates, Inc., Stillwater, OK; and Paul Togna, Ph.D., Shaw Environmental & Infrastructure, Lawrenceville, NJ

Flue gas desulfurization (FGD) wastewaters are typically very high in calcium, magnesium, sodium, chlorides, and sulfates with total dissolved solids concentrations ranging from 20,000 to 60,000 mg/L. Of particular concern in recent years includes nitrates, ammonia, biochemical oxygen demand, and various heavy met-

## TUESDAY TECHNICAL SESSIONS

als, especially selenium. Staged biological treatment concepts were developed by the authors to treat the organics, nitrogen compounds, and heavy metals contained in FGD wastewaters. A description of the technology developed is presented herein along with actual test results from pilot-scale studies.

2:25pm Discusser: **Nandan Vani, D. Sc, P.E.**, PEER Consultants, Baltimore, MD

2:35pm Closure & Floor Discussion

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### PAPER: 07-50

2:50PM

#### Full Scale Implementation of GE ABMet (R) Biological Technology for the Removal of Selenium from FGD Wastewaters

**Jill Sonstegard**, GE Water & Process Technologies, Salt Lake City, UT; and **Tim Pickett and James Hardwood**, GE Water & Process Technologies, Salt Lake City, UT

This paper will discuss the fundamentals of the ABMet biological metals removal process, its demonstrated removal efficiencies of selenium (as well as other trace metals), pilot scale performance data and the implementation of two systems designed to treat up to 2mgd and scheduled to be commissioned in late 2007

3:15pm Discusser - **Kar Munirathinam; Ph.D.**, N.A. Water Systems, Moon Township, PA

3:25pm Closure & Floor Discussion

3:40pm Coffee Break, Ballroom Foyer

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### PAPER: 07-51

3:50PM

#### FGD Wastewater Disposed of Via Deep-Well Injection at Duke Energy's Gibson Generating Station

**Peter Ten Eyck**, Nalco, Naperville, IL; and **Rick Cleveland**, Duke Energy, Owensville, IN; and **John Guidos**, Nalco, Naperville, IL, **Jim Mezo**, Duke Energy, Owensville, IN; and **Bill Nickrand**, Nalco, Naperville, IL

Duke Energy's Gibson Generating Station is operated as a zero liquid discharge facility. With the decision to install three new FGD scrubbers came the challenge of how to best treat and dispose of the final wastewater effluent. On-site deep-well injection was selected as the best of the limited available options. This report discusses the startup experience of a first-of-its-kind method for FGD wastewater effluent disposal.

4:15pm Discusser: **Arun Mittal**, Aquatech Corporation, Canonsburg, PA

4:25pm Closure & Floor Discussion

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### PAPER: 07-52

4:40PM

#### Performance of Pilot-Scale Constructed Wetland Treatment Systems for Flue Gas Desulfurization Waters

**Derek Eggert**, Clemson University, Clemson, SC; and **Carl Hensman**, Frontier GeoSciences, Seattle, WA; and **John Rodgers**, Clemson University, Dept. of Forestry & Natural Resources, Clemson, SC

An effective treatment system is needed to mitigate the risks of contaminants in flue gas desulfurization (FGD) waters to achieve discharge limits. Pilot-scale constructed wetland treatment systems (CWTS) were designed to evaluate removal of arsenic (As), mercury (Hg), nitrogen (N), selenium (Se) from FGD waters. Extent of removal ranged from 40.1% to 77.7% for As, 77.6% to 97.8%

## TUESDAY TECHNICAL SESSIONS

for Hg, 43.9% to 88.8% for N, and no removal to 84.6% for Se. This study indicates that pilot-scale CWTS can decrease potential constituents of concern (i.e. As, Hg, N, and Se) in FGD waters.

**5:05pm Discusser: Diane R. Martini, Sargent & Lundy, LLC, Chicago, IL**

**5:15pm Closure & Floor Discussion**

**PAPER: 07-53**

**5:30PM**

### **Initial Operating Experience With a Novel FGD Waste water Treatment System At Duke Energy's Marshall Steam Station**

**Cynthia Bryant; Robert Wylie, Duke Energy, Charlotte, NC; and Joe Frank; Angela Zagala and Peter Ten Eyck, Nalco Co., Naperville, IL**

Duke Energy's Marshall Steam Station employs a novel multi-stage wastewater treatment system to remove suspended solids and heavy metal contaminants from the FGD purge stream. The FGD wastewater treatment process consists of a pretreatment system wherein solids and initial metals removal are performed, followed by a unique constructed wetland treatment system for further removal of solids, mercury and selenium. This report discusses the initial operating experience results with the WWTP and constructed wetlands systems.

**5:50 Discusser: Patricia Scroggin, Burns & Donnell, Kansas City, MO**

**6:00 Closure & Floor Discussion**

## TUESDAY TECHNICAL SESSIONS

### RESURGENCE OF THE NUCLEAR POWER INDUSTRY

**2:00 - 5:30pm**

**INT'L. BALLROOM**

Without a doubt the power industry is witnessing a major resurgence in the design and construction of a new generation of nuclear plants in the US and worldwide. While many utilities are gearing up for the licensing process, reactor and other equipment suppliers, architect/engineers, constructors, chemical vendors and utilities are gearing up to meet the new challenges in designing and operating the more advanced and efficient reactors. This session includes papers related to the licensing and design challenges for the new generation of nuclear plants as they relate to water treatment issues; a new approach to integrated water management, sampling and monitoring for the nuclear industry; a cooling system performance improvement approach through real-time monitoring and control; and a practical performance assessment related to fouling of safety-related heat exchangers at a nuclear plant.

- Session Chair:** Julius Isaac, Bechtel Power Corporation, Frederick, MD
- IWC Representative:** Andrew Calderwood, Consultant, Pittsburgh, PA
- Discussion Leader:** Sandy Schexnailder, GE Water & Process Technologies, Dallas, TX

**PAPER: 07-54**

**2:00PM**

#### Challenges in Licensing and Water Treatment Design for the New Generation of Nuclear Power Plants

**Michael Chuk; Julius Isaac; P.E.,** Bechtel Power Corporation, Frederick, MD

Since no new nuclear plants have been designed and constructed in the US for over twenty-five years, architect/engineering firms, constructors, Nuclear Steam Supply System vendors, customers, and water treatment suppliers are facing many new challenges and a new learning curve. The paper includes case studies involving several of the most common reactor designs, along the different challenges posed by the licensing process, water management and seasonal variations in water quality. The paper describes how the more stringent water quality requirements are met; and the application of the most modern technologies to meet the more rigorous water quality requirements. There are many water treatment challenges – some generic and some site-specific ones, as described in this paper.

**2:25pm Discusser:** Bruce Larkin, Black & Veatch, Overland Park, KS

**2:35pm Closure & Floor Discussion**

**PAPER: 07-55**

**2:50PM**

#### Heat Exchanger Fouling in a Safety-Related Service Water System

**K. A. Selby,** Mechanical & Materials Engineering LLC, Evergreen, CO; **G. J. Licina and N. Sadeghi,** Structural Integrity Associates, Inc., San Jose, CA; **A.V. Dave; D. M. Fuller and T.J. Green,** Arizona Public Service Company – Palo Verde Nuclear Generating Station, Tonopah, AZ; and **N.M. Wilmshurst,** Electric Power Research Institute, Charlotte, NC

Palo Verde Nuclear Generating Station utilizes spray ponds to cool safety-related heat exchangers for normal and emergency shutdowns. In 2006, some heat exchangers in the Essential Spray



# SCHEDULE-A

	INT'L. NORTH BALLROOM	SALON I	SALON II	SALON III
	<b>SUNDAY, OCT. 21</b>			
	EXHIBIT HALL RECEPTION in INTERNATIONAL BALLROOMS CENTRAL AND SOUTH			
	<b>MONDAY, OCT. 22</b>			
8:00-11:00am		Wastewater/ Biological Treatment	Zero Liquid Discharge (ZLD)	Approaches to Minimizing Membrane Fouling
11:00am-12noon	Keynote & Awards Session			
	<b>12 noon-2:00pm</b> EXHIBIT HALL LUNCHEON in INTERNATIONAL BALLROOMS CENTRAL AND SOUTH			
2:00-5:00pm	Legionella, with Panel Discussion		Ion Exchange Special Applications	Improving Performance of Steam Electric Plants
	<b>4:30-7:00pm</b> EXHIBIT HALL RECEPTION in INTERNATIONAL BALLROOMS CENTRAL AND SOUTH			
	<b>TUESDAY, OCT. 23</b>			
8:00am - 12noon	ASME Panel Discussion	Blowdown Recycle & Equipment Design for Produced Water	Open Cooling Water Systems	FGD Wastewater Treatment Technologies & Discharge Limits

# T-A-GLANCE

## INT'L. NORTH BALLROOM

### SALON I

### SALON II

### SALON III

#### TUESDAY, OCT. 23

12noon-2:00pm EXHIBIT HALL LUNCHEON in INTERNATIONAL BALLROOMS CENTRAL AND SOUTH

2:00-5:00pm

Resurgence of the  
Nuclear Power  
Industry

Advanced Membrane  
Operations &  
Applications

Closed Cooling  
Water Systems

Industry Experiences  
with FGD Purge  
Wastewater

#### WEDNESDAY, OCT. 24

8:00am-12noon

Ion Exchange

New Monitoring  
Techniques for Boilers  
Cooling Towers, & FGD

Produced Water  
for SAGD  
Facility

Water  
Reclamation  
& Reuse

1:00-5:00pm

Post Conference  
Workshops

#### THURSDAY, OCT. 25

8:00-5:00pm

Post Conference  
Workshops

## TUESDAY TECHNICAL SESSIONS

Pond systems were found to be fouled. This paper discusses the investigation into the cause of the fouling, corrective actions taken, and the investigation into the ability of the heat exchangers to perform their design basis safety function in their fouled condition.

**3:15pm Discusser: Raymond M. Post; P.E., GE Water & Process Technologies, Trevose, PA**

**3:25pm Closure & Floor Discussion**

**3:40pm Coffee Break, Ballroom Foyer**

**PAPER: 07-56**

**3:50PM**

### **A New Approach to Integrated Water Management for Nuclear Industry**

**Mike Shepherd, GE Water and Process Technologies, Naperville, IL; and Eric Gardner, GE-Hitachi Nuclear Energy, Wilmington, NC**

WaterMD™ (the Program) is a comprehensive program for Boiling Water Reactors (BWRs) and Pressurized Water Reactors (PWRs) that integrates GE-Hitachi Nuclear Energy's (GEH) and GE Water and Process Technologies (GE W&PT) (the Company) into one holistic program to improve plant water quality and material condition, lower overall operating costs, improve overall fuel reliability, and focuses on implementing "Next Level Performance" solutions for customers. Integrating material condition assessments with state of the art monitoring and diagnostic technology yields cost-effective actions that can be implemented today to improve overall plant competitiveness for the future.

**4:15pm Discusser: Myron Feldman, Sentry Equipment Corporation, Oconomowoc, WI**

**4:25pm Closure & Floor Discussion**

**PAPER: 07-57**

**4:40PM**

### **Nuclear Power Plant Cooling System Performance Improvement through Real-Time Monitoring, Diagnostics and Control**

**Andrew J. Kern, Nalco Company, Lenoir City, TN; Peter Ten Eyck, Nalco Company, Pittsburgh, PA; and George Peabody, Nalco Company, Littleton, CO**

The fleet of U.S. nuclear plants, most with extended operating life, needs to maximize generation while reducing their total cost of operation. Managing the cost impact of open cooling water systems can be challenging. Nalco's 3D Trasar® technology represents a significant advance in cooling water monitoring, diagnosis and control along with improvements in available chemistries.

**5:05pm Discusser: Kumar Sinha, Bechtel Power Corporation, Frederick, MD**

**5:15 Closure & Floor Discussion**

# WEDNESDAY TECHNICAL SESSIONS

## ION EXCHANGE

**8:00am - 12noon**

**INT'L. BALLROOM**

This session will focus primarily on ion exchange polishing of steam condensate and various water polishing treatment options for boiler make-up systems including EDI and single bed cation polishing.

**Session Chair:** James Summerfield, Dow Water Solutions, Midland, MI

**IWC Representative:** Michael Gottlieb, ResinTech, Inc., West Berlin, NJ

**Discussion Leader:** Peter Meyers, ResinTech, Inc., West Berlin, NJ

**PAPER: 07-58**

**8:00AM**

### Practical Notes & Procedures in Condensate Polishing

**George J. Crits; William Runyan, Idreco USA, Inc., Ardmore, PA**

Selected notes and procedures in condensate purification are presented to help engineers in designing equipment and operating these in power plants. These notes are generally presented at power plant or condensate polishing symposiums.

**8:25am Discusser:** Gerry Alexander, Siemens Water Technologies, La Canada, CA

**8:35am Closure & Floor Discussion**

**PAPER: 07-59**

**8:50AM**

### Solving a Problem of Microorganisms Growth in Cation Exchangers in Abu Qir Fertilizers Co.

**Fatma Badawy; Hany Gomaa, Abu Qir Fertilizers & Chemical Industries Co., Alexandria, Egypt**

The lower tray nozzles of cation exchangers at demineralization plant suffered from micro-organisms growth. It has its nutrients from treated water, warm temperature from condensate and a moderate alkalinity. So replacing organic scavenger filters by strong cation resin to obtain decationized water. This acidic environment stops the micro-organisms growth.

**9:15am Discusser:** Albert Preuss, Aldex Chemical Co. LTD, Granby, QE, Canada

**9:25am Closure & Floor Discussion**

**9:40am Coffee Break, Ballroom Foyer**

**PAPER: 07-60**

**9:50AM**

### Economic Comparison of Electrodeionization And Mixed Bed Unit Operations

**Avijit Dey; Ph.D., Omexell, Inc., Houston, TX; and Bill Lloyd, Dow Water Solutions, Minneapolis, MN**

Historically there has been a widespread perception that Reverse Osmosis/ Electrodeionization (RO/ EDI) installations require higher capital expenditures when compared with conventional ion exchange based systems utilizing mixed bed deionizers. The combined effect of escalating caustic price, advances in low pressure RO membranes, and significant reduction in the power consumption across EDI modules have created a dramatic shift in the economics of high purity water systems due to favourable deionized water cost offered by EDI systems.

**10:15am Discusser:** Doug Kellogg, Siemens Water Technologies, Rockford, IL

**10:25am Closure & Floor Discussion**

## WEDNESDAY TECHNICAL SESSIONS

**PAPER: 07-61**

**10:40AM**

### **20 Years of Condensate Polishing at San Onofre Nuclear Generating Station**

**David Auerswald, JLS Engineering, Redondo Beach, CA**

This paper discusses the design and successful operation of the first Cation/Mixed-Bed Condensate Polisher in the United States. It identifies critical components and discusses the significance of decisions made in the design process. It further details the overall performance of the system over the more than 20 years of its operation as well as the effluent water quality of critical sub-components such as the Cation Polisher and the Fines Filters. Performance testing results and laboratory and field studies are included in the paper. It further discusses why this technology is recommended for all Pressured Water Reactors which have sea-water cooled condensers. Operations results with both ammonia and ETA chemistry are documented in the paper. The impact of boric acid and elevated temperatures on system are also outlined in the paper.

**11:05am Discusser: Brian Hoffman, Rohm and Haas Company, Philadelphia, PA**

**11:15 Closure & Floor Discussion**

## **NEW MONITORING TECHNIQUES FOR BOILERS, COOLING TOWERS, FLUE GAS DESULFURIZATION, AND PROCESS APPLICATIONS**

**8:00am - 12noon**

**SALON I**

This session will cover some new monitoring techniques for boilers, cooling towers, flue gas desulfurization (FGD), and process applications. The use of particle counters for pretreatment optimization, iron transport and condenser leakage is discussed; a novel new oxygen sensor capable of low ppb measurements is presented; and characterization of selenium in FGD waters is described. In addition, a means of controlling cooling tower treatment with an in-line monitor and the use of inductive conductivity for automation of peracetic acid concentrations in clean in place applications is presented.

**Session Chair: Deborah Bloom, Nalco Company, Naperville, NJ**

**IWC Representative: Manoj Sharma, Aquatech International Corp., Canonsburg, PA**

**Discussion Leader: James Dromgoole, Fort Bend Services, Inc., Stafford, TX**

**REPORT: 07-62**

**8:00AM**

### **Inductive Conductivity for Control of CIP Processes**

**Vadim Malkov, Hach Company, Loveland, CO; and Jeff Tocio, Anderson Instruments Company, Fultonville, NY**

A differential conductivity system based on two inductive conductivity sensors connected to a common controller was successfully tested to monitor concentration of Peracetic Acid-based sanitizer in Clean-In-Place process. The study was conducted at a major soft drink company's plant and has proven full applicability of the system to such processes.

**8:20am Closure & Floor Discussion**

# WEDNESDAY TECHNICAL SESSIONS

**REPORT: 07-63**

**8:30AM**

## **Case Studies Using New Luminescent Technology for Ppb Level of Dissolved Oxygen in High Purity Boiler Water**

**Jeff McKinney, Hach Company, Atlanta, GA**

Control of dissolved oxygen (DO) in high-pressure boiler water is critical in reducing corrosion and boiler tube failure. A new oxygen probe has been developed and introduced commercially that resolves key problems with traditional DO sensor technology. Traditional DO sensors use galvanic or polarographic amperometric technology that require regular calibration, electrolyte replenishment, careful membrane treatment, flow control and complex electrode regeneration on a regular basis to maintain accuracy. The new probe does not have membranes nor uses electrolyte. Instead it measures the rate of fade due to the presence of oxygen on a luminophor after it is exposed to blue light. Slope calibration is rarely needed and an automatic zero calibration is utilized to verify the system on a monthly basis. Use of this probe with controller has been demonstrated in several low-level oxygen power plant applications to optimize water treatment. Case studies from this plant experience will be discussed.

**8:50am: Closure & Floor Discussion**

**9:00am Coffee Break, Ballroom Foyer**

**PAPER: 07-64**

**9:10AM**

## **Using Particle Counters for Pretreatment Optimization, Iron Transport Monitoring, Condenser Leak Detection, and Carryover Monitoring - A Synopsis Of Experiences.**

**Robert Bryant, Chemtrac Systems, Inc., Norcross, GA**

Water analyses in almost all areas of power generation have focused on ionic measurements such as pH, conductivity, sodium, silica, chlorides, or other dissolved substances. This is particularly true for on-line, continuous analyzers. A common instrument used for particulate measurement is the turbidimeter. However, this instrument doesn't have the required sensitivity for detecting low levels of particulates in pretreatment systems or the boiler "recycle waters" (BFW, steam, condensate, BBD). On-line particle counters are being used for these applications in several power plants due to their ability to detect extremely low levels of particulates (<10 parts per trillion). Some benefits being realized are: Reducing R.O. fouling and extending membrane life, Detecting condenser tube leaks, Defining causes of boiler carryover (mechanical, chemical, hydraulic, etc) and Monitoring iron transport and optimizing condensate corrosion programs. The paper presents a case history on each application.

**9:35am Discusser: James Dromgoole, Fort Bend Services, Stafford, TX**

**9:45am Closure & Floor Discussion**

**REPORT: 07-65**

**10:00AM**

## **Characterization of Selenium Species in Flue Gas Desulfurization Waters using High Performance Liquid Chromatograph Inductively Coupled Plasma Mass Spectroscopy (HPLC-ICP-DRC-MS)**

**Carl Hensman, Frontier Geosciences, Seattle, WA; and Monica Garica-Strickland, Frontier Geosciences, Seattle, WA**

Coal-burning power plants are significantly decreasing air emissions of sulfur dioxides (SO<sub>2</sub>) by installing flue gas desulfurization (FGD) scrubbers. The most commonly used FGD scrubber type is referred to as a "wet scrubber" that utilizes lime or limestone

## WEDNESDAY TECHNICAL SESSIONS

(calcium carbonate) saturated water to solublize gaseous SO<sub>2</sub>, oxidize, and precipitate these sulfur compounds as calcium sulfite (CaSO<sub>3</sub>) or calcium sulfate (CaSO<sub>4</sub>). The resulting aqueous mixture is typically referred to as FGD water. At each coal-fired power plant, the composition of FGD water is dependant on many chemical and physical variables that include the coal source and composition, burner/FGD scrubber design and operation, post-scrubber treatment processes, and initial constituents in the local water supply. This results in FGD water being a complex mixture that must be treated in order to meet regulatory criteria (National Pollution and Elimination System permits; USEPA). To develop treatment systems for FGD waters, a chemical characterization such as speciation is required to understand the transform or transfer of these constituents to stable complexes that are easily removed. Selenium has been measured in FGD waters ranging from 45 1/4 mg/L to > 7 mg/L and is typically difficult to remove due to its stability as an oxyanion (selenite/selenate). The objective of this research was to conduct speciation analysis of selenium in FGD waters using high performance liquid chromatography inductively coupled mass spectroscopy (HPLC-ICP-DRC-MS). Method detection limits for these analyses are approximately 1 ug/L for injection of 100uL.

10:20am Closure & Floor Discussion

### PRODUCED WATER FOR SAGD FACILITY

**8:00am - 12noon**

**SALON II**

This session will focus on evaporators designed for Steam Assisted Gravity Drainage (SAGD) facilities. It begins with a single unit process approach for boiler feed water quality, followed by present day technical guidelines on how evaporators operate. Various process treatment schemes will be reviewed for different water sources as well as identifying the decision-making factors required for determining the best available treatment. Technical, economic and environmental impacts for two commercial operating SAGD plants will be presented.

**Session Chair:** Milind Kulkarni, Aquatech International Corp., Canonsburg, PA

**IWC Representative:** James Sabzali, Thermax Inc, Wynnewood, PA

**Discussion Leader:** Donald Downey, Purolite Company, Kitchener, ON, Canada

**REPORT: 07-66**

**8:00AM**

#### Technical, Economic and Environmental Impact of Blending High Hardness Brackish Water For Makeup Water to Generate Steam at EnCana's SAGD Facilities for Produced Water Session

**Caroline Wilson-Mussbacher**, EnCana Oil and Gas Partnership, Calgary, AB, Canada

The technical, environmental and economic impact of blending more brackish sources and treating with Ion Exchange is evaluated. Specifically McMurray formation water (hardness=487 mg/L CaCO<sub>3</sub>, TDS=21 000mg/L) is compared to Clearwater Formation (hardness=126 mg/L CaCO<sub>3</sub>, TDS=4090 mg/L). Using McMurray formation water will result in increased waste water to disposal up to an additional 263 m<sup>3</sup>/d, increased operating costs and chemical consumption, and increased capital costs up to an after tax cash flow loss of \$ 11,860,000 over 25 years to produce 1787 m<sup>3</sup>/d of soft makeup water for Christina Lake. Foster Creek is

## WEDNESDAY TECHNICAL SESSIONS

currently blending harder more brackish makeup water sources and the actual disposal volumes and chemical costs are compared to those predicted for Christina Lake. Challenges at Foster Creek make it difficult to evaluate the environmental and economic impact of blending harder water but it is apparent that the actual values at Foster Creek are much high then the predicted values for Christina Lake, indicating the Christian Lake values are much too conservative.

8:20am Closure & Floor Discussion

**PAPER: 07-67**

**8:30AM**

### **Produced Water and Brackish Water Treatment at SAGD Facilities.**

**John Benetti**, Jacobs Canada Inc., Calgary, AB, Canada

The paper will discuss the process options available for treatment of various water chemistries including brackish water at SAGD facilities.

8:55am Discusser: **Gordon Page**, Page Technology Ltd., Calgary, AB, Canada

9:05am Closure & Floor Discussion

9:20am Coffee Break, Ballroom Foyer

**PAPER: 07-68**

**9:30AM**

### **Guidelines for Produced Water Evaporators in SAGD**

**Dan Peterson**, HPD, LLC, Plainfield, IL

An evaporative process for treating Produced Water has been demonstrated in SAGD. This process is an improvement over conventional treatment methods in that it produces half the waste with three orders of magnitude improvement in recovered water quality. Design concepts are illustrated and explained in this paper.

9:55am Discusser: **J. Michael Marlett**, Aquatech International Corp., Hartland, WI

10:05am Closure & Floor Discussion

**REPORT: 07-69**

**10:20AM**

### **Fouling of Resin in EOR applications.**

**Guy Mommaerts** - Ion Exchange Services Inc., Elmira, ON, Canada

The impact of various foulants on resin performance is discussed. Cleaning methods are suggested. Appropriate operating practices are presented. Both SAC and WAC resin applications are covered.

10:40am Closure & Floor Discussion



# WEDNESDAY TECHNICAL SESSIONS

## WATER RECLAMATION AND REUSE

**8:00am - 12noon**

**SALON III**

This session will present four interesting case studies of treatment and reclamation of wastewater generated in power plants and refineries. The presentations will address the innovative unit processes applied to reclaim the various industrial wastewater streams and the applications chosen for reuse, to reduce wastewater discharges and overall plant water consumption.

**Session Chair:** Peter Midgley, Christ Water Technology Americas, LLC

**IWC Representative:** John T. Lucey, Jr.; P.E., HDR Engineering, Inc., Pittsburgh, PA

**Discussion Leader:** David Velegol, Chester Engineers, Moon Township, PA

**PAPER: 07-70**

**8:00AM**

### Continuous Blow Down Water In Coal Fired Steam Generation Power Plant Suralaya - PT. Indonesia Power with 3400MW Capacity

**Budi Satriyo; Marhan Saub, PLTU Suralaya - PT. Indonesia Power, Merak-Banten**

With a 450 m<sup>3</sup> capacity in the waste pond, we reduce the wastewater volumes by reusing it as water wash, fire fighting water, dust conditioner and coal stockpile spray water. We can reduce the operating cost up to 525,518,240 rupiahs / year.

**8:25am Discusser:** Peter Midgley, Christ Water Technology Americas, LLC

**8:35am Closure & Floor Discussion**

**PAPER: 07-71**

**8:50AM**

### Reclaiming Cooling Tower Blowdown - A case study at Sasol Synfuels

**Harold Grant, Sasol Technology, Secunda, MP, South Africa**

A case study on reclamation of cooling tower blow down in a 12MI/day plant using softening and membrane technologies enabling a saving of approximately 6% on raw water intake of a classical Coal to Liquids (CTL) plant and upgrading the blow down to polished water.

**9:15am Discusser:** David Velegol, Chester Engineers, Moon Township, PA

**9:25am Closure & Floor Discussion**

**9:40am Coffee Break, Ballroom Foyer**

**PAPER: 07-78**

**9:50AM**

### Time and Money -The Problem with Bad Water Sources and Worse Disposal Options

**Pierre Kwan, HDR Engineering, Bellevue, WA**

This poster provides side-by-side design, cost, and schedule comparisons of three 120 million gallon/year ethanol facilities with nearly identical water quality and quantity requirements but with widely varying source water qualities and wastewater discharge methods. These three plants bracket nearly the entire range of water treatment requirements that all large industrial facilities can encounter.

**10:15am Discusser:** John Lucey, HDR Engineering, Pittsburgh, PA

**10:25am Closure & Floor Discussion**

## WEDNESDAY TECHNICAL SESSIONS

**PAPER: 07-23**

**10:40AM**

### **Fate of Arsenic, Trace Organics and Other Constituents of Wastewater Origin During Aquifer Storage Recovery**

**David Pyne, ASR Systems LLC, Gainesville, FL**

Results will be presented from two, recently-completed research reports. One is for the WaterReuse Foundation, addressing the fate of constituents of wastewater origin during storage of reclaimed water in ASR wells at four sites, including two in Florida, one in Arizona and one in Australia. The second is for the Southwest Florida Water Management District, addressing the fate of arsenic during ASR storage, in both reclaimed and potable ASR wells, based upon analysis of operational data from 52 ASR wells and 41 observation wells in 12 ASR wellfields in SW Florida.

**11:05am Discusser: Jerry Penland, Chester Engineers, Moon Township, PA**

**11:15am Closure & Floor Discussion**

## Poster Session

Session Chair: Dan Rice - Dow Chemical, Midland, MI

IWC Representative: Craig Brown - Chemionex, Pickering, ON

The Poster Gallery will be located in the Exhibit Hall/Exhibit Hall Foyer. A Poster is a graphic presentation of an authors' paper or report through graphs, photos, diagrams and text. The authors will be able to discuss the content of their poster with attendees during specific presentation hours. Many authors discover it useful to plan a brief presentation to address the obvious questions and allow the remainder of the time for detailed discussions. No audiovisual equipment is provided for poster presentations. The IWC Poster Session features display style presentations that are viewable during the Exhibit Hall hours of operation. In addition, Poster Presenters may be available for discussion about their poster during Exhibit Hall Hours of Operation.

### POSTER: 07-72

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#### **A Novel Method to obtain Water from the Atmosphere using Solar Absorption /Desorption System**

Esam Elsarrag, Hoare Lea Consulting Engineers, Dorset,

### POSTER: 07-73

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#### **Application of Cascade Aerator Coupled with Filter Bed in the Treatment of Underground Water**

David K. Dodoo, Alberta Kotoku, University of Cape Coast, Ghana

### POSTER: 07-74

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#### **Sea Water Cooling System Design**

Naresh Shah, Worley Parsons, Houston, TX

### POSTER: 07-75

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#### **Treatment of water containing bacteria by electrochemical reactor**

Ederio Bidoia, State University of Sao Paulo (UNESP), Rio Claro, SP

### POSTER: 07-76

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#### **Evaluation of Water Quality of ElNasr-3 main drain in Egypt Using QUAL2K Model**

Sherif Hassanin, Ministry of Water Resources in Egypt, Alexandria, Egypt; and Mohamed El-Ganainy, P.D. in Faculty of Engineering - Alex. University, Alexandria, Egypt

### POSTER: 07-77

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#### **"How To" Interpret U.S. Patent Claims**

Clifton E. McCann, Venable LLP, Chevy Chase, MD

## Continuing Education Workshops

IWC Continuing Education Workshops are designed to provide practical information on water-related subjects that include basic understanding of the topic as well as detailed case histories. They are presented by experts in their field and are not sales presentations. They provide an opportunity to ask questions and exchange operating experiences. An additional registration fee is required, and a minimum number of registrants is required. Please check with the IWC Registration Desk for more information and registration. Tickets will be required to attend..

### Boiler Water Operation, and Water Treatment

Wednesday, October 24; 1 - 5:00pm

**Instructor:** James Robinson, GE Betz, Trevoise, PA

Covered in this workshop is the water quality required for steam boilers, the various treatments that are being used, and new developments for protection from scale, and corrosion. The boiler as well as the pre-boiler and condensate systems are reviewed, discussed, and illustrated as to potential problems but also the most effective water treatments being used today. Water treatment controls needed is provided for all types of treatment along with trouble shooting guidelines. Operators, Utility plant supervisors, and manager can benefit greatly by the practical and useful information obtained a this workshop.

### FGD Systems and Operating Guidelines

Wednesday, October 24; 1 - 5:00pm

**Instructor:** Enos L. Stover, PhD, PE, DEE, The Stover Group, Stillwater, OK

This workshop provides a though review of FGD system operation and the problems commonly encountered. It reviews the methods and techniques that are available to control typical problems and the programs used for their minimization or control. This workshop provides practical and useful guidelines to identify the potential problems but also the chemical and mechanical methods that are in use today for their control. This information is of great help to operators and managers of FGD systems.

### Design and Operation of Reverse Osmosis Systems

Wednesday, October 24; 1 - 5:00pm

**Instructor:** Jantje Johnson, Genesys North America, Eden Prairie, MN

This workshop provides information on pretreatment, design and operation of reverse osmosis systems. Guidelines are given on pretreatment, reverse osmosis membrane selection, RO design and operation. Detailed discussions are provided on the operation + evaluation of reverse osmosis systems. Detailed information will be provided on cleaning of reverse osmosis systems. Examples of various systems will be shown and discussed. This workshop is a great opportunity to ask questions and solve problems. This workshop is designed for reverse osmosis system operators and owners.

## Wastewater Treatment Processes

Wednesday, October 24; 1 - 5:00pm

Instructor: Kar Munirathinam, PhD, N.A. Water Systems, Moon Township, PA

This workshop provides a review of the various waste water processes in use today, how they operate, what treatment and what controls are needed for successful waste water effluent quality. Discussions of various case histories identifies limitations, typical problems, new technologies and which process should be used for various waste water qualities. The physical, chemical, and biological processes and equipment are reviewed along with the expected effluent quality with good and poor operation. This workshop provides practical operational information on many types of waste waters and thus is ideal for those new as well as experienced with waste water processing.

## Cooling and Chilled Water Treatments

Thursday, October 25; 8:00am - Noon

Instructor: Arthur Freedman, Arthur Freedman & Associates, Inc., East Stroudsburg, PA, and Paul Puckorius, Puckorius & Associates, Inc., Arvada, CO

This workshop provides a detailed review of corrosion, scale, fouling, and microbiological problems and methods for their minimization in cooling tower systems as well as chilled (closed) water systems. The newest water treatment programs are reviewed, along with their limitations and water qualities required for successful use. Detailed discussions and guidelines are provided for monitoring, testing, and controls for each of the potential problems. Identification of the potential problems associated with white rust, enhanced copper tubes, mild steel tubes, MIC corrosion, film fill fouling and more provide valuable guidelines for all attendees. This is a great workshop for all levels of persons involved in cooling and chilled water system operation and protection.

## Membrane Systems Troubleshooting

Thursday, October 25; 8:00am - Noon

Instructor: Luis Carvalho, P.Eng., GE Water & Process Technologies, Mississauga, ON, Canada

Covered in this workshop is how to identify potential and existing problems in the operation of all types of membrane systems. This involves water flow, pressures, leakage, and maintenance. Examples of various systems are show and typical problems identified along with the techniques used to resolve those problems. Guidelines are given relative to what to look for, what testing is needed, and common action plans to minimize problems. A must for all membrane system operators and owners.

## Reuse Water and Water Conservation

Thursday, October 25; 8:00am - Noon

Instructor: Arthur Freedman, Arthur Freedman & Associates, Inc., East Stroudsburg, PA, and Paul Puckorius, Puckorius & Associates, Inc., Arvada, CO

Covered in this workshop is the identification of the reuse and reclaimed water quality needed to be successfully used in cool-

# CONTINUING EDUCATION WORKSHOPS

ing tower, boiler water, and process water systems. Various reused waters are identified that can be utilized with no, little, and extensive treatments prior to being added to the water using system. Water conservation techniques and procedures are identified along with the potential for zero liquid discharge from cooling water systems. Water reuse and conservation of fresh water supplies is expanding rapidly and this workshop provides the information and guidelines for successfully planning and utilization of "used " waters. A must for all persons interested in saving water.

## **Water Preparation Processes**

Thursday, October 25; 8:00am - Noon

**Instructor: Cynthia Carmen, Graver Water Systems, LLC, Cranford NJ**

This workshop reviews the various processes used to treat raw water for use as boiler feed, cooling makeup, process, and potable water. Detailed discussions of clarification, cold and hot lime, and filtration provides not only effective operating guidelines but also optimum controls and trouble shooting aspects of each process. This is a must for operators, utility supervisors, and water treatment engineers working with these systems.

## **Ion-Exchange Technology & Practical Operating Practices**

Thursday, October 25; 1- 5:00pm

**Instructor: Wayne Bernahl, W. Bernahl Enterprises Ltd., Elmhurst, IL**

This workshop provides detailed review of the various ion exchange processes for softening and demineralizing water as preparation for boilers, cooling, and process applications. How to evaluate existing systems, their resin, operation, and water quality of ion exchange units is an excellent troubleshooting and informative portion of this work shop. A review of the different ion exchange resins available along with the newest developments and how the can be used to provide specific water quality is a must for water treatment operations. A great opportunity to as questions and solve problems.

## **Legionnaire Disease Concerns/ Guidelines/Testing**

Thursday, October 25; 1 - 5:00pm

**Instructor: Paul Puckorius, Puckorius & Associates, Arvado, CO**

This workshop provides a very practical understanding of Legionnaires Disease in cooling water and potable water systems. It provides detailed review of monitoring and control of the Legionella bacteria but also how it is spread, and what can be done to minimize their presence. A review of the guidelines issued by CTI, ASHRAE, CDC, OSHA, and others is provided for water treatment and testing in cooling and potable water systems. This is a must for all water treatment operators, suppliers, owners and managers of facilities but also health concerned management.

## EXHIBITOR LISTING

The IWC Exhibit Hall features 50 different opportunities to learn about practical and innovative solutions for the industrial water treatment industry from industry leaders. The Exhibit Hall is located inside International Ballrooms Central and South, across from the Conference Registration Desk.

Hours of Operation are Sunday, October 21 from 5:00-8:00pm; Monday, October 22 from 12noon until 2:00pm and again from 4:30 until 7:00pm; and Tuesday, October 23 from 12noon until 2:00pm. JOIN US FOR LUNCH (open to all registered attendees) on Monday and Tuesday! Also, during Sunday and Monday evening hours, join us for the Exhibitor-sponsored receptions.

### ALCO CHEMICAL

IWC BOOTH NUMBER: 44,45

Contact: Mike Standish

Phone: 423-629-1405

Fax: 423 698 8723

Email: [william.nicholas@nstarch.com](mailto:william.nicholas@nstarch.com)

Website: [www.alcochemical.com](http://www.alcochemical.com)

ALCO chemical's skilled technical teams have developed a wide range of cost-effective solutions to meet individual customer needs. ALCO offers a diverse portfolio of specialty additives for water treatment applications, including: mineral deposit control, oil-in-water separation, corrosion inhibition, flocculation, micro-biological control, solids dispersion and metals removal.

### AQUATECH INTERNATIONAL CORPORATION

IWC BOOTH NUMBER: 9

Contact: Amy Bloom

Phone: 724-746-5300

Fax: 724-746-5359

Email: [blooma@aquatech.com](mailto:blooma@aquatech.com)

Website: [www.aquatech.com](http://www.aquatech.com)

Aquatech offers solutions in design/engineering, project management, manufacturing, and commissioning / field troubleshooting for: Pretreatment, Ion Exchange, Membrane Purification, WasteWater Recycle/Reuse and Zero Liquid Discharge. With the various technologies offered among these categories, Aquatech can offer integrated water treatment solutions for every aspect of water treatment required for an industrial process.

### ARGONIDE CORP.

IWC BOOTH NUMBER: 50

Contact: Henry Frank

Phone: 407-322-2500

Fax: 407-322-1144

Email: [henry@argonide.com](mailto:henry@argonide.com)

Website: [www.argonide.com](http://www.argonide.com)

NanoCeram® electropositive filters far outperform typical "sieve" based filters. NanoCeram® has a 0.2 micron pore rating, yet flows like a 2 micron filter. As a pleated cartridge, it provides a very high dirt-holding capacity and low pressure drop; plus the reliability of a depth filter. With SDI levels < 0.5, NanoCeram® is the ultimate pre-filter for R.O., ultraviolet and ozone systems by reducing the organic loads in these systems providing peak efficiency for greater lengths of time.

### ASSOCIATION OF WATER TECHNOLOGIES

IWC BOOTH NUMBER: 27

Contact: Heidi Zimmerman

Phone: 301-740-1421

Fax: 301-990-9771

Email: [awt@awt.org](mailto:awt@awt.org)

Website: [www.awt.org](http://www.awt.org)

The Association of Water Technologies is the largest organization for water treatment specialists, representing over 500 companies, focusing on the application of water treatment for industrial and commercial systems. AWT promotes activities that result in a favorable business environment for our members, enabling them to successfully compete in the industry.

### BWA WATER ADDITIVES

IWC BOOTH NUMBER: 19

Contact: Erin Dawson

Phone: 678-802-3029

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Email: [erin.dawson@wateradditives.com](mailto:erin.dawson@wateradditives.com)

Website: [www.wateradditives.com](http://www.wateradditives.com)

BWA Water Additives is a leading global provider of antiscalants, corrosion inhibitors and biocides for specialty water solutions in industrial & process water treatment, desalination, oilfield, pulp and paper, and other process industries. Our top performing brands such as Belclene®, Belsperse®, Belcor®, Bellacide®, BromiCide®, Belgard®, Bellasol®, and Flocon® provide you the best value in meeting today's water treatment needs.

### CHEMICO INTERNATIONAL, INC.

IWC BOOTH NUMBER: 4

Contact: Sam Owens

Phone: 361-883-8255

Fax: 361-883-5446

Email: [sam@chemico.com](mailto:sam@chemico.com)

Website: [www.chemico.com](http://www.chemico.com)

CHEMICO specializes in high quality safe products and services for cooling towers, boilers and closed loop systems. We formulate and manufacture easily blended concentrates which are available for end users and distributors. CHEMICO developed and patented a water conservation process for cooling towers, HiCycler®. This process reuses up to 95% of blow-down.

### CHEMTRAC SYSTEMS, INC.

IWC BOOTH NUMBER: 1

Contact: Bob Bryant

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Email: [chemtrac@chemtrac.com](mailto:chemtrac@chemtrac.com)

Website: [www.chemtrac.com](http://www.chemtrac.com)

Chemtrac Systems, Inc. has been providing start-to-finish on-line instrumentation to help operators optimize the water treatment process for 20 years. Its Streaming Current Monitors, Particle Monitors, Particle Counters, and Turbidimeters help detect system failures and allow an immediate response to process changes.



## EXHIBITOR LISTING

### CHRIST WATER TECHNOLOGY AMERICAS

IWC BOOTH NUMBER: 43

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Email: [dsmith@tenerychrist.com](mailto:dsmith@tenerychrist.com)

Website: [www.tenerychrist.com](http://www.tenerychrist.com)

Christ Water Technology Americas is a custom designer and manufacturer of industrial water treatment equipment. Christ Water Technology supplies a broad spectrum of industries such as power generation, pulp and paper, oil and gas, chemical production, pharmaceuticals, food and beverage, plating and finishing, medical facilities, micro-electronics and mining. Christ Water Technology Americas is a supplier of the high pressure, high flow CONESEP condensate polishing system specifically designed for the power industry.

### COOLING TECHNOLOGY INSTITUTE

IWC BOOTH NUMBER: 42

Contact: Frank Foster

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Email: [ffoster@towerperformance.com](mailto:ffoster@towerperformance.com)

Website: [www.cti.org](http://www.cti.org)

Since 1950, the Cooling Technology Institute has been a non-profit governing association dedicated to improvement in technology, design, performance, and maintenance of Evaporative Heat Transfer Systems (EHTS). With worldwide membership the Cooling Technology institute is the leading organization in the field of cooling technology.

### ECO-TEC INC.

IWC BOOTH NUMBER: 15

Contact: Deep Rana

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Email: [drana@eco-tec.com](mailto:drana@eco-tec.com)

Website: [www.eco-tec.com](http://www.eco-tec.com)

Eco-Tec is an award-winning, globally recognized manufacturer of water purification systems for industrial operations. Eco-Tec provides proven integrated technologies based on proprietary technologies that offer significant cost reduction and superior process efficiency. Eco-Tec has provided more than 1500 systems in over 52 countries, and is represented in all major markets.

### EIMCO WATER TECHNOLOGIES

IWC BOOTH NUMBER: 36

Contact: Kavah Someah

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Email: [info.ewt@glv.com](mailto:info.ewt@glv.com)

Website: [www.glv.com](http://www.glv.com)

We specialize in the development and worldwide marketing equipment used in industrial water and wastewater, as well as large scale water intake and industrial effluent.

## EXHIBITOR LISTING

### EPICOR, INCORPORATED

IWC BOOTH NUMBER: 12

Contact: Rose Bussicolo  
Phone: 908-925-0800  
Fax: 908-925-7795  
Email: [epicorinc@aol.com](mailto:epicorinc@aol.com)  
Website: [ww.epicorinc.com](http://ww.epicorinc.com)

Manufacturer of powdered resins and resin-fiber mixtures, specially-formulated, custom-blended bead resin. OEM distributor for Rohm & Haas, Dow and Sybron.

### FRENCH CREEK SOFTWARE

IWC BOOTH NUMBER: 31

Contact: Robert Ferguson  
Phone: 610-935-8337  
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Email: [frenchcreek@frenchcreeksoftware.com](mailto:frenchcreek@frenchcreeksoftware.com)  
Website: [www.frenchcreeksoftware.com](http://www.frenchcreeksoftware.com)

French Creek develops and markets industry standard water treatment software tools for professionals including WaterCycle® for cooling water, hyd-RO-dose™ for membrane systems, WatSim™ for potable, DownHole SAT for oil field, and MineSAT for waste water. Serving the water treatment industry since 1989.

### FUTURE PIPE INDUSTRIES

IWC BOOTH NUMBER: 18

Contact: Charlene Alaniz  
Phone: 281-847-2987 x 118  
Fax: 281-847-4216  
Email: [c.alaniz@futurepipe.com](mailto:c.alaniz@futurepipe.com)  
Website: [www.futurepipe.com](http://www.futurepipe.com)

The Future Pipe Group manufactures pipe in Gulfport Mississippi, and Houston Texas. Future Pipe offers the widest range of sizes, pressures and resin systems for Fiberglass reinforced composite pipe of any manufacturer in the United States.

### GE WATER & PROCESS TECHNOLOGIES

IWC BOOTH NUMBER: 35

Contact: Jennifer Sekella  
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Email: [jennifero.sekella@ge.com](mailto:jennifero.sekella@ge.com)  
Website: [www.gewater.com](http://www.gewater.com)

GE Water & Process Technologies, a unit of GE Infrastructure, is a leading global supplier of water treatment, wastewater treatment and process systems solutions. GE delivers customer value by improving performance and product quality and by reducing operating costs and extending equipment life in a broad range of products and services. These products and services are used to optimize total water/process system performance, safeguard customer assets from corrosion, fouling and scaling, and protect the environment through water and energy conservation.

## EXHIBITOR LISTING

### **GRAVER WATER SYSTEMS, INC./ ECODYNE**

IWC BOOTH NUMBER: 25

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Email: [rapplegate@graver.com](mailto:rapplegate@graver.com)

Website: [www.graver.com](http://www.graver.com)

Graver Water Systems, LLC designs and manufactures water and wastewater treatment equipment and systems. Graver's engineers are knowledgeable in pretreatment, degasification, hot lime softening, boiler make-up, condensate polishing, wastewater treatment, cooling water treatment, and oil/water separation for industrial plants and electric utilities on a global basis.

### **HACH COMPANY**

IWC BOOTH NUMBER: 8

Contact: Jeff McKinney

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Fax: 970-669-2932

Email: [orders@hach.com](mailto:orders@hach.com)

Website: [www.hach.com](http://www.hach.com)

Hach Company provides advanced water quality instrumentation systems for laboratory and on-line analysis and discharge compliance. Also offers test kits, chemistries and expert technical support.

### **HEISLER GREEN**

IWC BOOTH NUMBER 2

Contact: James Green

Phone: 630-271-1218

Fax: 630-271-1703

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Website: [www.heislergreen.com](http://www.heislergreen.com)

Heisler Green is a water treatment chemical supplier, service company and consulting company based in the Chicago area. Heisler Green is the first company to develop CoolGreen, a GREEN water treatment that is biodegradable, biorenewable, earth friendly and capable of reducing water and energy consumption by up to 80%.

### **ILLINOIS WATER TECHNOLOGIES**

IWC BOOTH NUMBER: 13

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Website: [www.illinoiswatertech.com](http://www.illinoiswatertech.com)

Illinois Water Technologies is an independent service and retrofit provider of water treatment equipment. We also stock ion exchange-resin, filter media and provide custom replacement parts as well as common vendor supplied components.

Our customers enjoy 24-hour availability, commitment to service, and cost savings that IWTech brings to the marketplace.

## EXHIBITOR LISTING

### **INTEGRATED SEPARATION SOLUTIONS, LLC (ISS)**

IWC BOOTH NUMBER: 21

Contact: John Scott  
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Fax: 262-736-4214  
Email: [jscott@isepsol.com](mailto:jscott@isepsol.com)  
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Complete line of water treatment service and equipment including filtration, ion exchange, EDI, and reverse osmosis for production of pure water for the power, pharmaceutical, semiconductor, and other industries.

### **JOHNSON MARCH SYSTEMS, INC.**

IWC BOOTH NUMBER: 48

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Email: [john.sands@johnsonmarch.com](mailto:john.sands@johnsonmarch.com)  
Website: [www.johnsonmarch.com](http://www.johnsonmarch.com)

Johnson March Systems is a custom designer and fabricator of chemical dosing systems, steam and water sampling panels, chlorination systems, ammonia feed systems, specialty skid mounted packages, and dust suppression systems. JMSI is ISO 9001-2000 certified by Underwriters Laboratories. JMSI has a full staff of mechanical, electrical, instrumentation and civil engineers.

### **LANXESS SYBRON CHEMICALS INC.**

IWC BOOTH NUMBER: 10

Contact: Mechelle Jones  
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Website: [www.sybronchemicals.com](http://www.sybronchemicals.com)

Sybron Chemicals now becomes LANXESS Sybron Chemicals. Our passion is state-of-the-art Ion Exchange Technology coupling traditional high quality with constant product innovation. Whatever you need -we have the solution, custom-made, as your reliable partner. Competent. Economical. Responsive. Lewatit®. Ionac® From beads to bright solutions.

### **LUMEX INTERNATIONAL**

IWC BOOTH NUMBER: 40

Contact: Nikolay Sveshnikov  
Phone: 703-243-7103  
Fax: 703-243-3771  
Email: [info@lumexint.com](mailto:info@lumexint.com)  
Website: [www.lumexint.com](http://www.lumexint.com)

We proudly present our lines of instrumentation for water analysis, which include in-line water hardness monitors AKMC-1, in-line oil-in-water analyzers AE-2, capillary electrophoresis systems, and fluorescence detectors. Our instruments allow for determination of total water hardness, anions, cations, pesticides, and other contaminants at very low concentrations, with minimal reagent consumption.

## EXHIBITOR LISTING

### **METTLER-TOLEDO THORNTON, INC.**

IWC BOOTH NUMBER: 33

Contact: David Gray

Phone: 781-301-8600

Fax: 781-301-8701

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Website: www.mt.com/thornton

Mettler-Toledo Thornton, Inc. develops, manufactures and markets liquid process measurement/control instrumentation and sensors for pure water treatment systems, power industry applications, pharmaceutical waters, semiconductor fabrication and wastewater monitoring. Measurements include conductivity/resistivity, TOC, pH, ORP, dissolved oxygen, ozone, flow, temperature and pressure. Thornton is a business unit of Mettler-Toledo's Process Analytics Division.

### **N.S. NETTLES & ASSOCIATES, INC.**

IWC BOOTH NUMBER: 39

Contact: Sandy Nettles

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Email: nettles@tampabay.rr.com

Website: www.snettles.com

Geophysical mapping for water supply development. Design and supervision construction of water supply wells and brine reject wells. Design and supervision construction of alternative water supply intakes and brine discharge methodologies.

### **NALCO COMPANY**

IWC BOOTH NUMBER: 22

Contact: Kathy Schillinger

Phone: 630-305-1239

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Email: kschillinger@nalco.com

Website: www.nalco.com

Nalco is the leading global provider of integrated water treatment and process improvement services, chemicals and equipment programs for a variety of industrial and institutional customers. We provide technologically advanced, engineered solutions that enable our customers to increase production yields, lower manufacturing costs, extend asset life and maintain environmental standards.

### **NEPTUNE CHEMICAL PUMP CO.**

IWC BOOTH NUMBER: 16

Contact: Thomas R. O'Donnell

Phone: 215-699-8700

Fax: 215-699-0370

Email: tomo@neptune1.com

Website: www.neptune1.com

Neptune is a manufacturer of chemical metering pumps, chemical feed systems, portable mixers, polymer feed systems, bromine feeders, bypass feeders, glycol feeders, sample coolers, corporation stops and injection quills.

## EXHIBITOR LISTING

### NIAGARA BLOWER CO.

IWC BOOTH NUMBER: 37

Contact: Peter Demakos

Phone: 716-875-2000

Fax: 716-875-1077

Email: [pgdemakos@niagarablower.com](mailto:pgdemakos@niagarablower.com)

Website: [www.niagarablower.com](http://www.niagarablower.com)

Niagara Blower is a design-build engineering manufacturer of closed-loop (wet surface) evaporative cooling systems. These Wet Surface Air Coolers (WSAC) can be used as 1st stage evaporators and also use poor quality water as makeup. Advantages include lower outlet temperatures, significant makeup water savings and blowdown reduction.

### PALL CORPORATION

IWC BOOTH NUMBER: 11

Contact: Robert Emproto

Phone: 516-484-3600

Fax: 516-484-0364

Email: [remproto@pall.com](mailto:remproto@pall.com)

Website: [www.pall.com](http://www.pall.com)

Pall Power Generation is the global leader in providing filtration and separation products and services to the Power Generation industry, whether power is produced from fossil, nuclear, or renewable sources. Pall products are used to purify water, oils, and gases in every stage of the power cycle.

### POLLUTION EQUIPMENT NEWS/ RIMBACH PUBLISHING INC.

IWC BOOTH NUMBER: 23

Contact: Karen Galante

Phone: 412-364-5366

Fax: 412-369-9720

Email: [karen@rimbach.com](mailto:karen@rimbach.com)

Website: [www.rimbach.com](http://www.rimbach.com)

POLLUTION EQUIPMENT NEWS provides information on products and services offered in the industrial and municipal environmental abatement and control fields. Products and services are featured through product and literature reviews, product selection charts, as well as technical articles, case history or application articles.

### PUCKORIUS & ASSOCIATES, INC.

IWC BOOTH NUMBER: 6

Contact: Paul Puckorius

Phone: 303-674-9897 FL 863-655-1036

Fax: 303-674-1453

Email: [Waterphd1@aol.com](mailto:Waterphd1@aol.com)

Website: [Puckorius.com](http://Puckorius.com) and [watertrainingservices.com](http://watertrainingservices.com)

Puckorius & Associates, Inc. provides consulting services for cooling, boiler, waste, and all types of water systems. This includes troubleshooting, water treatment specifications & preparation, and independent evaluations. Water Training Services provides workshops, manuals, papers, technical reports, and all types of training from basic to advanced for cooling, boilers, waste water, and all water systems for treatment selection to operator/management/water treatment persons.

# EXHIBITOR LISTING

## PURELINE TREATMENT SYSTEMS

IWC BOOTH NUMBER: 47  
Contact: Russ Elmore  
Phone: 800-383-7873  
Fax: 949-757-0281  
Email: russ.elmore@pureline.com  
Website: www.pureline.com/

PureLine is dedicated to preserving and protecting the integrity of vital water supplies across the nation and around the world with careful research, state-of-the-art engineering and quality manufacturing of innovative chlorine dioxide generations technologies designed to disinfect water to exacting standards.

## PUROLITE COMPANY

IWC BOOTH NUMBER: 49  
Contact: Don Downey  
Phone: 800-343-1500  
Fax: 610-668-2813  
Email: info@puroliteusa.com  
Website: www.PUROLITE.com

Purolite is the only global manufacturer that is 100% dedicated to the development of ion exchange resins. With manufacturing, warehousing, and research facilities around the globe, we can efficiently serve all your resin needs. Purolite, with over 400 products, can satisfy the widest variety of water treatment applications.

## RESINTECH, INC.

IWC BOOTH NUMBER: 17  
Contact: David Malkmus  
Phone: 856-768-9600  
Fax: 856-768-9601  
Email: ixresin@resintech.com  
Website: www.resintech.com

ResinTech is a manufacturer and supplier of ion exchange resins, activated carbon and Aries Filterworks point-of-use DI Water loops and cartridges. Stop by to learn about our ULTRA line of pre-regenerated and mixed bed resins including MBD-ULTRA, the highest purity effluent mixed bed resin available.

## ROHM AND HAAS COMPANY

IWC BOOTH NUMBER: 14  
Contact: William Rogers  
Phone: 215-592-2627  
Fax: 215-409-4534  
Email: brogers@rohmmaas.com  
Website: www.rohmmaas.com

Rohm and Haas manufactures a complete line of Ion Exchange Resins and adsorbents for the water Treatment Industry. Amberlite, Amberjet, Ambersep and Amberpack are Rohm and Haas Trademarks.

## EXHIBITOR LISTING

### **SAMCO TECHNOLOGIES, INC.**

IWC BOOTH NUMBER: 28

Contact: Robert Bellitto

Phone: 716-743-9000

Fax: 716-743-1220

Email: [bellittor@samcotech.com](mailto:bellittor@samcotech.com)

Website: [www.samcotech.com](http://www.samcotech.com)

Provider of innovative minimum waste/high yield water management solutions for produced water, boiler feed, condensate polishing, brine concentration/crystallization and Zero Liquid Discharge (ZLD). Exclusive licensee of Rohm & Haas Advanced Amberpack Deionization (ADI) technology.

### **SANAIR**

IWC BOOTH NUMBER: 32

Contact: Thomas McGlynn

Phone: 804-897-1177

Fax: 804-897-0070

Email: [tem@sanair.com](mailto:tem@sanair.com)

Website: [www.sanair.com](http://www.sanair.com)

SanAir Technologies Laboratory is an AIHA-accredited environmental microbiology laboratory, specializing in testing for fungi and bacteria. We offer analytical and consulting services for environmental microbial testing, including analysis of fungi and bacteria for indoor air quality (IAQ) investigations and DNA sequencing identification of Legionella in water.

### **SCHREIBER LLC**

IWC BOOTH NUMBER: 3

Contact: William Kunzman

Phone: 205-655-7466

Fax: 205-655-7669

Email: [billk@schreiberwater.com](mailto:billk@schreiberwater.com)

Website: [www.schreiberwater.com](http://www.schreiberwater.com)

Serving Industrial & Municipal markets since 1979, Schreiber Corporation solves wastewater treatment problems through the application of energy-efficient, innovative, and proprietary equipment/process technology. Schreiber offers a complete system from head works to tertiary filtration. Our patented treatment processes such as the Continuous Sequencing Reactor® and compressible media filter "Fuzzy Filter®" combine effectiveness and efficiency to produce the industry's highest quality products.

### **SENTRY EQUIPMENT CORP.**

IWC BOOTH NUMBER: 26

Contact: Lynn Castrodale

Phone: 262-567-7256

Fax: 262-567-4523

Email: [lynnc@sentry-equip.com](mailto:lynnc@sentry-equip.com)

Website: [www.sentry-equip.com](http://www.sentry-equip.com)

Sentry Equipment Corp is a worldwide supplier and technological leader in the manufacture, marketing and servicing of sampling components/ systems and specialty heat exchangers.



# EXHIBITOR LISTING

## SEVERN TRENT SERVICES

IWC BOOTH NUMBER: 24

Contact: Richard A. Mitman

Phone: 215-997-4031

Fax: 215-997-4062

Email: [rmitman@stswater.com](mailto:rmitman@stswater.com)

Website: [www.severntrentservices.com](http://www.severntrentservices.com)

Severn Trent Services is the leading supplier of disinfection systems utilizing chlorine, sodium hypochlorite, chlorine dioxide, ammonia, sulfur dioxide, carbon dioxide, chemical metering systems, ultraviolet systems, and filtration for water and wastewater treatment. Severn Trent Services also designs complete systems and provides service support of equipment for industrial treatment systems.

## SWAN/INDUSTRIAL ANALYTICS

IWC BOOTH NUMBER: 38

Contact: Nick Afragola

Phone: 203-245-0380

Fax: 203-245-3698

Email: [nafragola-IAC@sbcglobal.net](mailto:nafragola-IAC@sbcglobal.net)

Website: [www.swan.ch](http://www.swan.ch)

Industrial Analytics is the US distributor Swan Analytical Instruments. Swan manufactures on-line instrumentation for steam, boiler, demineralization and cooling tower water quality analysis. Additionally, Swan Systems can design and fabricate sample and conditioning panels. Proven engineering expertise is available for complete "turnkey" project design and management.

## THERMAX INC.

IWC BOOTH NUMBER: 29

Contact: Jim Sabzali

Phone: 248-474-3050

Fax: 248-474-5790

Email: [jsabzali@thermax-usa.com](mailto:jsabzali@thermax-usa.com)

Website: [www.thermax-usa.com](http://www.thermax-usa.com)

Thermax manufacturers different varieties of ion exchange resins for various applications in water treatment and specialty areas such as pharma, biotech, catalyst, sugar, metal recovery and more. Thermax resins are marketed under trade name Tulsion

## THERMO SCIENTIFIC

IWC BOOTH NUMBER: 41

Contact: Erin White

Phone: 978-232-6000

Fax: 978-232-1042

Email: [info.water@thermo.com](mailto:info.water@thermo.com)

Website: [www.thermo.com/process](http://www.thermo.com/process)

The Orion On-Line products from Thermo Scientific offer a full range of process monitors for applications where monitoring water is absolutely critical.

## EXHIBITOR LISTING

### VEOLIA WATER SOLUTIONS & TECHNOLOGIES

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IWC BOOTH NUMBER: 30

Contact: Catherine Broderick

Phone: 815-609-2052

Fax: 815-609-2044

Email: [catherine.broderick@veoliawater.com](mailto:catherine.broderick@veoliawater.com)

Website: [www.veoliawater.com](http://www.veoliawater.com)

Veolia Water Solutions & Technologies offers unique technologies, process design, construction and installation of systems for Source Water Treatment, Water Recycle/Reuse and Zero Liquid Discharge. Centers of Expertise include HPD – Evaporation/Crystallization Processes, Whittier Filtration – Advanced Filtration Systems and N.A. Water Systems – Solutions for the Entire Water Cycle.

### WATER & POWER TECHNOLOGIES

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IWC BOOTH NUMBER: 5

Contact: Bill Himebaugh

Phone: 800-494-2525

Fax: 801-973-9733

Email: [william.himebaugh@wpt.com](mailto:william.himebaugh@wpt.com)

Website: [www.wpt.com](http://www.wpt.com)

Water & Power Technologies is the premier treatment solution for a world that demands high purity water. Whether through our Waterpro (Build Own Operate “water by the gallon”) operations or by supplying equipment, services or custom engineered systems, we provide water treatment solutions specific to your industry and needs. Our state-of-the-art engineering tools, specifically 3-D solids modeling, provide us with the power to maximize use of space and interfaces to assure efficient integration into your plant or facility. We invite you to take a look at how we safely and efficiently meet the important water treatment quality your facility demands.

### WATER QUALITY ASSOCIATION

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IWC BOOTH NUMBER: 34

Contact: Tanya Lubner, PhD

Phone: 630-505-0160

Fax: 630-505-9637

Email: [tlubner@wqa.org](mailto:tlubner@wqa.org)

Website: [www.wqa.org](http://www.wqa.org)

The Water Quality Association (WQA) is a not-for-profit international trade association representing the residential, commercial, industrial, and small community water treatment industry. WQA maintains a close dialogue with other organizations representing different aspects of the water industry in order to best serve consumers, government officials, and industry members.

# EXHIBITOR LISTING

## WATERS EQUIPMENT

IWC BOOTH NUMBER: 16

Contact: Brian Reichley

Phone: 215-699-8700

Fax: 215-699-8795

Email: [brianr@watersequipment.com](mailto:brianr@watersequipment.com)

Website: [www.watersequipment.com](http://www.watersequipment.com)

Waters Equipment has been building custom steam/water sampling and analysis systems for over 40 years. Additionally, we manufacture sample coolers, pressure reducers, refillable resin columns, high temperature shut-off valves, temperature control valves, portable samplers, multi-stream sequencers, single-point sample conditioning modules, cooling water isolation skids and hotwell samplers.

## WESTECH ENGINEERING

IWC BOOTH NUMBER: 20

Contact: Jim Woods

Phone: 801-265-1000

Fax: 801-265-1080

Email: [mpalm@westech-inc.com](mailto:mpalm@westech-inc.com)

Website: [www.westech-inc.com](http://www.westech-inc.com)

For raw water pretreatment, cooling water, water reuse, wastewater and potable water treatment, WesTech is your independent source for a full range of reliable industrial and municipal process treatment equipment designed, engineered and built for long lasting efficiency. For new plants, design build projects, retrofits, or entire plant flowsheets, WesTech offers the process, manufacturing and project experience required.

**Exhibit Hall hours of operation are Sunday, October 21 from 5:00-8:00pm; Monday, October 22 from 12noon until 2:00pm and again from 4:30 until 7:00pm; and Tuesday, October 23 from 12noon until 2:00pm.**

**JOIN US FOR LUNCH (open to all registered attendees) on Monday and Tuesday! Also, during Sunday and Monday evening hours, join us for the Exhibitor-sponsored receptions.**

### AQUATECH INTERNATIONAL CORPORATION

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Suite: Quince/Poinsetta

Suite Hours of Operation:

Sunday: 8:00pm-? (11- midnight)

Tuesday : 4:00-6:00pm

Established in 1981, Aquatech International Corporation is a global leader in water purification technology for industrial and infrastructure markets with a focus on desalination, wastewater recycle reuse, and zero liquid discharge.

Aquatech's product groups include Raw Water Treatment, Ion Exchange, Membrane Processes (UF/RO/MBR), Thermal Desalination (MED/MSF), Wastewater/Effluent Treatment and Zero Liquid Discharge.

Contact: Karin Brightwell

Phone: 724-746-5300

Fax: 724-746-5359

Email: aic@aquatech.com

Website: www.aquatech.com

### DOW WATER SOLUTIONS

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Suite: Dogwood/Camelia

Suite Hours of Operation:

Monday Hours: 12noon - 2:00pm & 7:00pm-12am

Dow Water Solutions is a comprehensive global provider of water and non-water treatment and separations solutions based on a wide range of technologies and services. Products from Dow Water are used in industrial water treatment, municipal water treatment, ultra pure water, commercial and home drinking water purification, and other applications.

Contact: Brian Powers

Phone: 800-447-4369

Fax: 989-832-1465

Website: www.dowwatersolutions.com

### ECODYNE LIMITED

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Suite: Narcissus

Suite Hours of Operation:

Monday: 10:00am - 12noon & 2:00 - 6:30pm

Tuesday: 10:00am - 12noon & 2:00 - 6:30pm

Wednesday: 9:00 - 11:00am

Ecodyne designs and manufacturers water treatment equipment and systems worldwide. Ecodyne offers deaerators, ion exchange equipment, reverse osmosis systems and EDI technology as well as cooling tower design, construction, upgrades and repairs. Principal markets include power generation, oil and gas, chemical, pulp and paper as well as municipal potable water.

Contact: Paul Kitchen

Phone: 905-331-1404

Fax: 905-332-6726

Email: info@ecodyne.com

Website: www.ecodyne.com

## INFO-SHARE SUITES

### GRAVER WATER SYSTEMS, LLC

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Suite: Narcissus

Suite Hours of Operation:

Monday: 10:00am - 12noon & 2:00 - 6:30pm

Tuesday: 10:00am - 12noon & 2:00 - 6:30pm

Wednesday: 9:00 - 11:00am

Graver Water Systems, LLC designs and manufactures water and wastewater treatment equipment and systems. Graver's engineers are knowledgeable in pretreatment, degasification, hot lime softening, boiler make-up, condensate polishing, wastewater treatment, cooling water treatment, and oil/water separation for industrial plants and electric utilities on a global basis.

Contact: Robert Applegate

Phone: 908-653-4202

Fax: 908-653-4300

Email: [rapplegate@graver.com](mailto:rapplegate@graver.com)

Website: [www.graver.com](http://www.graver.com)

### LANXESS SYBRON CHEMICALS INC.

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Suite: Azalea/Begonia

Suite Hours of Operation:

Monday: 6:00pm - 12:00am

Sybron Chemicals now becomes LANXESS Sybron Chemicals. Let's change the future. Our passion is state-of-the-art Ion Exchange Technology coupling traditional high quality with constant product innovation. Whatever you need - we have the solution, custom-made, as your reliable partner. Competent. Economical. Responsive. Lewatit®. Ionac®. From beads to bright solutions.

Contact: Mechelle A. Jones

Phone: 609-8845-1501

Fax: 609-894-8641

Email: [mjones@sybronchemicals.com](mailto:mjones@sybronchemicals.com)

Website: [www.sybronchemicals.com](http://www.sybronchemicals.com)

### VEOLIA WATER SOLUTIONS & TECHNOLOGIES

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Suite: Kahili

Suite Hours of Operation:

Sunday: 5:00 - 8:00pm

Monday: 8:00am-10:00pm (CASINO NIGHT from 7:00-10:00pm with cocktails)

Tuesday: 7:30am - 2:00pm

Veolia Water Solutions & Technologies offers unique technologies, process design, construction and installation of systems for Source Water Treatment, Water Recycle/Reuse, and Zero Liquid Discharge. Centers of Expertise: HPD – Evaporation/Crystallization Processes, Whittier Filtration – Advanced Filtration Systems, and N.A. Water Systems – Solutions for the Entire Water Cycle.

Contact: Catherine Broderick

Phone: 815-609-2052

Fax: 815-609-2044

Email: [catherine.broderick@veoliawater.com](mailto:catherine.broderick@veoliawater.com)

Website: [www.veoliawater.com](http://www.veoliawater.com)

# NOTES

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# NOTES



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## WELCOME!

Welcome to the 68th Annual International Water Conference® (IWC), held October 21-25, 2007 at the Hilton in Walt Disney World Resort in Orlando, Florida. We are pleased to return to this location, only the second time outside of the city of Pittsburgh, PA.

Whether you are a first-time attendee or have been to the IWC before, we are glad that you have chosen to attend this year's event. With more than 70 technical presentations, Poster Session, a "sold-out" Exhibit Hall, Info-Share Suites, Continuing Education Workshops and plenty of opportunities for peer networking, we hope that you will find this Conference to be rewarding and educational. As always, we welcome your comments on ways that we can improve the IWC. Following the Conference, a full survey will be e-mailed to you for your consideration. Please take a few minutes and complete the survey to help us in our planning process.

There are many ways that you can contribute! If you would like to become more active in the IWC, see any member of the IWC Executive Committee for more information.

Have a great conference experience, and we look forward to seeing you next year in San Antonio, Texas, along the River Walk!

## LOBBY LEVEL



## MEZZANINE LEVEL

