



70th Annual
**International
Water Conference**

October 4-8, 2009



The Hilton Hotel in the
Walt Disney World® Resort
Orlando, Florida, USA

CONFERENCE PROGRAM GUIDE

TABLE OF CONTENTS

Schedule at a Glance	Pages 32-33
Chairman's Welcome	Pages 2-3
Continuing Education Workshops	Pages 45-48
General Information	Pages 4-8
Exhibitor Information	Pages 49-64
Hotel Maps	Inside Cover
Info-Share Suite Listing	Page 9
IWC Advisory Council	Page 5
IWC Executive Committee	Page 4
IWC Sponsors	Page 8
Keynote / Awards Session	Page 14
Spouse's Breakfast	Page 5
Technical Sessions, by day:	
Monday AM Technical Sessions	Pages 10-14
Industrial Wastewater Treatment	10
Keynote Session	14
Trace Contaminant Removal	11
Wastewater Reuse / Recycle in the Food & Beverage Industry	12
Monday PM Technical Sessions	Pages 15-23
Current Trends in Refinery Wastewater Treatment	19
Field Data/Case studies of Membrane Technologies: UF, MBR, EDI, RO	15
Semi-Conductor / High Purity Water / Ultrapure Water (Pharma/Electronics)	21
Water Treatment Technologies to Operating and New Nuclear Plants	17
Zero Liquid Discharge (ZLD) Solutions	22
Tuesday AM Technical Sessions	Pages 24-30
HRSG & Boiler Tube Failure (BTF) Analyses, & Corrective Measures	24
Improving Sustainability through Water Reuse and Conservation	29
Produced Water	27
Water & Wastewater Management in Power Plant FGD Systems – Part I	26
Tuesday PM Technical Sessions	Pages 31-38
Cycle Chemistry Control in Fossil-fueled Steam Generation Systems	30
Cooling Water Reuse/Energy Conservation	34
Management in Power Plant FGD Systems – Part II	35
Recovery & Reuse of Produced Water	37
Wednesday AM Technical Sessions	Pages 38-44
Cooling Water New Technologies	38
Ion Exchange Technology	40
On line Monitoring (Analytical)	42
Power Plant Applications	44

GENERAL INFORMATION

CHAIRMAN'S WELCOMING ADDRESS

Welcome to the 70th annual International Water Conference® (IWC). There are many changes occurring in the water treatment industry and it is extremely important that workers in the field of water treatment keep up with the changes. The Engineers' Society of Western Pennsylvania (ESWP), the IWC Advisory Council, and the IWC Executive Committee are very proud to provide the IWC Conference as a very important source for new information and training in the water treatment industry. Please review this program carefully. It reflects our efforts to continue to offer diversity in selecting technical papers for the conference that provide information relevant to current issues and problems within the industry. There is a total of 20 timely sessions that will appeal to anyone who is active in the field of water and wastewater.



Wayne E. Bernahl

We always do our best to eliminate any schedule conflicts where 2 papers of similar subject interest are being presented at the same time. However, with a large program and the varied interests of the attendees it is impossible to eliminate conflicts for everybody. Therefore, all papers that are received by the due dates will be available for sale electronically on flash memory sticks and in hard copy at the reprint desk.

The conference also offers the opportunity to attend many workshops, which provide Continuing Education Credits. They are designed for both newcomers to the water treatment industry as well as professionals who have been involved in the industry for years. The workshops are held on Wednesday afternoon and Thursday. Registration for the workshops is open at the registration desk during the conference if you did not pre-register.

Our exhibit hall is filled with exciting displays from leading suppliers to the industry. The exhibits display the latest technological developments in water and wastewater treatment. Take advantage of this opportunity to meet directly with industry experts. Lunches and refreshments will be supplied in the exhibit hall during lunch breaks and all conference registrants are welcome.

We are very happy to be located again at the Hilton Hotel at Walt Disney World. This facility is well suited to a conference of our size. All meeting rooms are on the same floor as is the exhibit area. The Hilton also has many restaurants, bars, and services available while you are at the conference. There are also many fine restaurant facilities within an easy walk of the hotel as well.

This year's keynote speaker is David Klanecky. David is the global research and development (R&D) director of Dow Water & Process Solutions, based in Edina, MN. He is responsible for directing and conducting R&D programs related to Dow's water strategy and oversees the global technical service operations of the business. In this role, David oversees a team of 200 people in research centers across North America, Europe and Asia. David's talk will concentrate on new technologies and advancements in the water treatment industry. David will be giving his interesting

GENERAL INFORMATION

and informative presentation during the Keynote Session on Monday morning.

Of course a conference of this size does not get put together without the hard work of a lot of people. I want to especially thank the ESWP staff: Dave Teorsky, Conor McGarvey, Michael Gaetano, and Tracy Devlin for their hours of hard work. One of them will always be at the registration desk during operating hours to answer any questions and provide any help that you might need.

Every Executive Committee member is a volunteer and has spent hours coordinating sessions, exhibits, workshops, and marketing to make sure the conference runs smoothly. Dan Rice is the 2009 IWC Technical Program Chairperson. This is one of the most time consuming positions on the IWC Executive Committee and I want to thank Dan for the fine job he did in putting the 2009 IWC technical program together.

I would also like to thank the representatives of the Advisory Council companies that offer their expertise and advise to keep the conference current and interesting for all. The companies of the Advisory Council also sponsor various events like the coffee breaks, fellowship evenings, and other items that help make the conference better for all of us. Please thank the members of the Advisory Council for their efforts in helping to make the 2009 IWC a success. If you have any interest in becoming a member of the Advisory Council please see a staff member at the registration desk.

There are so many people directly involved in the conference, Session Chairs, Discussion Leaders, Discussers, and Authors. They put in much time and effort to make the IWC one of the best technical conferences for those in the business of water and wastewater treatment. This is our goal and what we strive to achieve every year. Thank you to all.

I hope that you enjoy this year's Conference. I look forward to meeting many of you during our time in Orlando!

Sincerely,

Wayne

Wayne E. Bernahl

2009 IWC General Chair

W. Bernahl Enterprises, Ltd.

GENERAL INFORMATION

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, based in Pittsburgh, PA. Learn more at www.eswp.com. The IWC is planned mainly through the volunteer efforts of these top industry professionals who make up the IWC Executive Committee and IWC Advisory Council Company representatives. The ESWP extends a sincere thank you to the entire Executive Committee for their efforts in planning this years conference. A very special thanks goes to the General Chair of this years conference, Wayne Bernahl!

GEORGE ABRAHIM

Veolia Water Solutions & Technologies

General Chair

WAYNE BERNAHL

W. Bernahl Enterprises Ltd.

University Outreach

CRAIG BROWN

Chemionex

Proceedings/Electronic Publishing

ANDREW CALDERWOOD

Consultant

JAMES DROMGOOLE

Fort Bend Services, Inc.

Marketing

MICHAEL GOTTLIEB

ResinTech

Keynote/Nominations

JOSEPH LOFTIS

Consultant

Workshops

JOHN T. LUCEY, JR. PE

HDR Engineering, Inc.

Spouse Program

DENNIS MCBRIDE

Fluor Enterprises, Inc.

Internet Forum/Electronic Publishing

WAYNE MICHELETTI

Wayne C. Micheletti, Inc.

PAUL PUCKORIUS

Puckorius & Associates, Inc./Water Training Serv.

Technical Program

DAN RICE

Consultant

Exhibits

JAMES SABZALI

Thermax Inc.

Web Advertising

MANOJ SHARMA

Aquatech International Corp.

Scholarships/Awards

DAVID SIMON

Cyrus Rice Water Consultants

Imm. Past General Chair

KUMAR SINHA, P.E.

Bechtel Power

Budget

BRADLEY WOLF

Navigant Consulting

GENERAL INFORMATION

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 & wastewater treatment, and are willing to make a commitment to participate in several planning meetings thru the year to plan the IWC. In addition to promotional benefits for your firm or company, AC reps are entitled to complimentary conference registration.

For more information about the IWC, see any member of the IWC Executive Committee or contact the IWC offices.

AMBI-DESIGN, INC.

Shan Sundaram, P.E.

AQUATECH INTERNATIONAL CORP.

Devesh Mittal

ASHLAND HERCULES WATER TECHNOLOGIES

Mike Dalton

AVANTECH, INC.

Steven Gagnon

BECHTEL POWER

Colleen Layman, P.E.

CALGON CARBON CORPORATION

David Smith

CHEMTREAT, INC.

Raymond M. Post, P.E.

CHESTER ENGINEERS

Michael Ryder

CHRIST WATER TECHNOLOGY AMERICAS,LLC

Peter Midgley

DOW CHEMICAL COMPANY

James Summerfield

ECO-TEC INC.

Michael Sheedy

EPICOR INCORPORATED

Fred Keough

FLUOR ENTERPRISES, INC.

Rafique Janjua

FORT BEND SERVICES, INC.

James Dromgoole

GE WATER & PROCESS TECHNOLOGIES

Robert Taylor

GOLDER ASSOCIATES INC.

Paul Pigeon, P.E.

GRAVER WATER SYSTEMS, LLC

Robert Applegate

ION EXCHANGE LLC

James D. Shivers

KALLURI GROUP, INC.

Ramesh Kalluri

LANXESS SYBRON CHEMICALS, INC.

Dwight Tamaki

ORICA WATERCARE INC.

Abigail Holmquist

RESINTECH

Peter Meyers

SENTRY EQUIPMENT CORPORATION

Myron Feldman

SEVERN TRENT SERVICES

Charles J. Guzelli

SIEMENS WATER TECHNOLOGIES

Bill Willersdorf

THE PUROLITE COMPANY

Donald Downey

VEOLIA WATER SOLUTIONS & TECHNOLOGIES

John Kane

WATER & POWER TECHNOLOGIES, INC.

Anthony Fuhrman

GENERAL INFORMATION

ABOUT THE IWC

The IWC is the world's premier conference for understanding and dealing with the technical and business challenges of industrial water treatment. IWC presents the latest in scientific advances and practical applications in this field, cutting across a wide range of industries and functional areas.

As the preeminent international technical forum in the field, the IWC will bring together more than 500 end users, researchers, practicing engineers, managers, educators, suppliers and contractors. It is dedicated to advancing new developments in the treatment, use and reuse of water for industrial and engineering purposes.

The IWC has always been a strong educational conference. Attendees come to learn about the latest applications available in the industrial water treatment industry, educate themselves in current technology and applications through attendance in IWC workshops, and network with their peers active in water treatment.

WHAT MAKES THE IWC DIFFERENT?

All papers presented at the IWC are carefully peer reviewed for quality and to ensure no commercial aspect is evident. In addition to the broad educational and networking opportunities being offered, the IWC invites you to participate through our unique Prepared Discussion program. Each Paper presentation at the Conference is followed by a Prepared Discussion—a thoroughly considered, different perspective on the topic. This is followed by an open floor discussion when all audience members and presenters can fully interact—ask questions, seek clarification, and raise alternative viewpoints. In essence—learn more!

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.

PRE-PRINT LOCATION

Pre-prints for most technical presentations are available at the Pre-Print Area located beside registration. Pre-prints can be purchased for \$5.00 per copy. Also, you can find copies of previous years' IWC Proceedings (for \$55 per volume). Additionally, we are pleased to bring back the entire collection of pre-prints on a 1 GB flash drive. The Pre-Print Area will be open on Sunday from 5:00–7:00 PM, Monday from 9:00 AM–6:00 PM, Tuesday from 9:00 AM–5:00 PM, and Wednesday 8:00 AM–12:00 noon.

CONFERENCE PROCEEDINGS

All registered attendees (exc. Exhibit only) receive a CD containing the Official Conference Proceedings of the 70th Annual International Water Conference®. The CD will be direct mailed to you approximately 2 months following the conference.

CALL FOR PAPERS

To participate in the 2010 International Water Conference® as a presenter, please watch for the opening of the IWC Call For Papers. The Call For Papers is done exclusively on-line through the IWC home page at www.internationalwaterconference.org. For more information on how to become active in the IWC as an Exhibitor, Advisory Council Company, Executive Committee member, please contact Conference Manager Conor McGarvey at 412-261-0710, or by e-mail at c.mcgarvey@eswp.com

GENERAL INFORMATION

AMERICANS WITH DISABILITIES ACT

The International Water Conference® and the Engineers' Society of Western Pennsylvania (ESWP) support the Americans with Disabilities Act (ADA), which prohibits discrimination against, and promotes public accessibility for, those with disabilities. We ask those requiring specific equipment or services as an attendee to contact the ESWP Conference Department and advise us of any such requirements in advance.

PROFESSIONAL DEVELOPMENT HOURS

The Engineers' Society of Western Pennsylvania, sponsor of the IWC, is recognized as an Approved Provider by the Florida Board of Professional Engineers Bureau of Licensing. As such, attendees are eligible to earn up to 20 Professional Development Hours (PDH) to satisfy Continuing Education requirements. Official confirmation of your attendance will be provided upon request.

ATTENDEE RECEPTIONS

To help you enjoy your stay in Orlando, Florida during the 2009 IWC, we have many special events and activities planned for you. Join your fellow conference attendees at the annual Get Acquainted Reception, held on Sunday in the Exhibit Hall to welcome you to the Conference. Also, all registered attendees are welcomed to attend the Welcome Reception on Monday evening in the Exhibit Hall. 2 luncheon buffets are also provided in the Exhibit Hall on Monday and Tuesday. Schedule time to visit the exhibit and enjoy lunch on us!

If your spouse is accompanying you to the IWC please properly register him or her at the Registration Desk to gain admittance into these events

SPOUSES WELCOME BREAKFAST

For spouses who are traveling with conference registrants, the IWC will host a Welcome Breakfast on Monday, October 5 at the Hilton Hotel. We will have a representative from the Orlando Convention & Visitors Bureau present to discuss the many sites of Orlando, as well as special discounted event pricing of many of the best sites to see. You will also be able to meet and network with other spouses to plan your own agenda of activities. Please complete registration form at the IWC Registration Desk. Advance registration is required.

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 conference staff from 8:00 am Monday through noon on Wednesday. Messages will be retained until the end of each day.

IWC FUN RUN

Come join us for the 24th annual IWC Fun Run in Orlando! This event, sponsored by ResinTech, is open to all runners and walkers attending the conference and T-shirts will be awarded to all participants. Start Time & Place: Tuesday morning, Oct. 6 at 7:00 AM sharp; meet in the Hilton Hotel lobby at 6:45 AM. Distance: 3 miles – flat and easy course.

NAME BADGE IDENTIFICATION

All registered conference attendees are asked to please wear your official IWC name badge at all times. Your official IWC name 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. To avoid any confusion with access to the events, please refrain from personalizing your official IWC name badge with any stickers, ribbons, etc., not provided by the Registration Desk.

GENERAL INFORMATION

REGISTRATION LISTS

Registrations received prior to September 28, 2009 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 September 28, 2009 and on-site during the conference. Please visit the IWC web site following the conference.

An electronic version of the full Registration List will be available at the Registration Desk the morning of Wednesday, October 7. It provides the names of all registered attendees in both Excel and comma-delimited text formats. There is a \$25 fee.

CO-MEETINGS

The ASME Water Technologies Committee will meet on Wednesday, October 7 from 1:00-5:00 PM and on Thursday, October 8 from 8:30 AM-12:00 noon. The Committee will be working on the following documents:

- Consensus on Operating Practices for Control of Water and Steam Chemistry in Combined Cycle and Cogeneration Power Plants,
- Consensus on Precommissioning of Cogeneration and Combined Cycle Power Plants, and
- Consensus Document on Steam Generators in Thermal EOR (Enhanced Oil Recovery) Systems

Everyone is Welcome!

FUTURE CONFERENCE DATES

October 23-28, 2010

The Crowne Plaza Riverwalk Hotel, San Antonio, TX, USA

November 13-16, 2011

at the Hilton in the Walt Disney World® Resort, Orlando, Florida, USA

SPONSORS

Thanks to all of those who help to produce and present the 70th Annual International Water Conference®. A special thanks to the sponsors of this year's activities:

- Aquatech International - Hotel Key Cards
- Auchtel Products, Ltd. - Welcome Banner
- Bowen Engineering - Conference Tote Bag
- Epicor, Inc., - Monday AM Coffee Break
- Golder Associates - Tuesday AM Coffee Break
- Golder Associates - Tuesday PM Coffee Break
- HDR Engineering - Water Bottle
- Resintech, Inc. - Fun Run
- Venable, LLP - Monday AM Coffee Break

AQUATECH INTERNATIONAL CORPORATION

Suite: Poinsettia/Quince

Suite Hours: Sunday 4:00 PM-Midnight

Contact: Amy Bloom

Phone: 724-746-5300

Fax: 724-746-5359

E-Mail: aic@aquatech.com

Website: www.aquatech.com

GRAVER WATER SYSTEMS, LLC/ ECODYNE WATER

Suite: Narcissus

Suite Hours: Mon/Tues; 10 AM-Noon & 2:00-6:30 PM, Wed; 9:00-11:00 AM

Contact: Robert Applegate

Phone: 908-653-4202

Fax: 908-653-4300

E-mail: rapplegate@graver.com

Website: www.graver.com

LANXESS SYBRON CHEMICALS

Suite: Azalea/Begonia

Suite Hours: Monday 7:30 PM - Midnight

Contact: Dwight Tamaki

Phone: 609-893-1100

Fax: 609-894-8641

E-mail: dtamaki@sybronchemicals.com

Website: www.ionexchange.com

VEOLIA WATER N.A.

Suite: Jasmine

Suite Hours*: Monday 7:00-8:00 AM Breakfast; Tuesday 7:00 8:00 AM Breakfast

Contact: Carla Robinson

Phone: 412-809-6712

Fax: 412-809-6711

E-mail: Carla.Robinson@veoliawater.com

Website: www.veoliawaterstna.com

Veolia Water Solutions & Technologies will host Breakfast at 7 AM in our InfoShare Suite this year, featuring models of two unique technologies:

Monday - Macro Porous Polymer Extraction (MPPE)

Tuesday - AnoxKaldnes™ Moving Bed Biofilm Reactor (MBBR)

*Advance reservations are required; contact Carla Robinson at carla.robinson@veoliawater.com. Stop by to meet our presenting authors — a schedule is available in Booth 36.

MONDAY SESSIONS

INDUSTRIAL WASTEWATER TREATMENT

Date: *Monday, October 5*

Time: *8:00-11:00 AM*

Room: *Crystal Room*

Industrial clients are looking for innovative and cost-effective ways to solve their wastewater treatment challenges and meet increasingly stringent standards. This session will include three papers presenting interesting case studies where innovative technologies were utilized for industrial wastewater treatment. The papers will describe the details of the technology and how that technology provided cost and/or efficiency benefits for the client.

Session Chair: *Michael Ryder, Chester Engineers, Moon Township, PA*

Discussion Leader: *Jerry L. Penland, Chester Engineers, Moon Township, PA*

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

PAPER: IWC 09-01

8:00 AM

HOW A MEDIA FILTER, WITH SUSTAINABLE "GREEN" MEDIA, AN INNOVATIVE MEDIA REGENERATION DESIGN, SOLVED 3 MAJOR PROCESS WATER PROBLEMS AT A U.S. ALUMINUM MILL.

Joe Haligowski, Filtra Systems Company, Farmington Hills, MI

Filtra-Systems STiR media filter is the third generation of our proven technology, which builds upon 400+ successful installations. Based on this filter's historical success removing contaminants, and third generation cost reductions, a US Aluminum mill completed a 9-month pilot study on 3 distinctly different water streams.

Discusser: John Schubert, HDR, Pittsburgh, PA 8:25 AM

Closure and Floor Discussion 8:35 AM

PAPER: IWC 09-02

8:50 AM

THREE-PHASE MINING EFFLUENT TREATMENT PLANT TO MEET STRINGENT STANDARDS

Chris Howell and Dave Christophersen, Crown Solutions Co., LLC - A Veolia Water Solutions & Technologies Company, Vandalia, OH

High-rate ballasted flocculation technology, cyanide oxidation and carbon adsorption make up an advanced, three-phase cyanide and metals removal system for Marlin Mine. The new plant is designed to meet compliance with the International Cyanide Code and other highly stringent standards.

Discusser: Andy Stern, Chester Engineers, Charleroi, PA..... 9:15 AM

Closure and Floor Discussion 9:25 AM

Break..... 9:40 AM

MONDAY SESSIONS

PAPER: IWC 09-03

10:00 AM

INNOVATIVE RETROFIT FOR MUNICIPAL LANDFILL LEACHATE TREATMENT USING MOVING BED BIOFILM REACTOR TECHNOLOGY (MBBR)

**Christian Cabral, Eva Santos, Mark Smock and William Kelly
N.A. Water Systems – a Veolia Water Solutions & Technologies
Company, Moon Township, PA**

Moving Bed Biofilm Reactors coupled with activated sludge systems as pretreatment is a reliable process solution for typical variations in Food and Beverage industrial effluents. This combination of systems has a greater buffering capacity than conventional treatments and provides a significant reduction in O&M requirements compared to activated sludge.

Discusser: Jerry L. Penland, Chester Engineers,

Moon Township, PA..... 10:25 AM

Closure and Floor Discussion 10:35 AM

Conclusion..... 10:50 AM

TRACE CONTAMINANT REMOVAL

Date: Monday, October 5

Time: 8:00-9:40 AM

Room: Salon I

There was a time when water treatment was focused on the removal of “major” components – color, hardness and other ions, silica and iron. These impurities were often measured in levels of tens or hundreds of ppm. In industrial applications the primary objective was to reduce the incoming organic and ionic load to minimize any negative impact on hardware such as boilers and turbines. However, increased awareness of the impact trace contaminants are having on the environment and health has led to an entirely new set of water treatment challenges. Often the contaminants are now measured ppb, or even ppt, and the workhorse technologies such as IX and RO may no longer be the best or most cost effective solution. Target impurities such as arsenic, perchlorate, radium, boron, endocrine disruptors, and mercury are among a new list of candidates for removal requiring new ideas on media, equipment and processes.

**Session Chair: David Smith, Calgon Carbon Corporation,
Pittsburgh, PA**

**Discussion Leader: Peter Ritchey, Severn Trent Water
Purification, Inc., Colmar, PA**

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

PAPER: IWC 09-05

8:00 AM

EVALUATION OF TREATMENT TECHNIQUES FOR SELENIUM REMOVAL

**Fredrick W. Vance, The Dow Chemical Company, Midland, MI;
Kyle Smith, Dow Water and Process Solutions; Midland, MI; Tony
Lau, Infilco Degremont Inc; Richmond, VA**

Several techniques were evaluated for the treatment of selenium, including the use of anion exchange resins, selective adsorbents, zero valent iron, reverse osmosis, and biological reduction. The similarities and differences will be discussed in terms

MONDAY SESSIONS

of waste streams produced and ultimate fate of the selenium.

Discusser: *Claude Gauthier, The Purolite Company (Canada), Paris, Ontario, Canada* 8:25 AM

Closure and Floor Discussion: 8:35 AM

PAPER: IWC 09-06

8:50 AM

PATENT PITFALLS-A LOOK AT WHY CALGON AND CLEARWATER WATER PURIFICATION PATENTS FAILED AND HOW YOU CAN ADOPT A PATENT POLICY THAT AVOIDS NEEDLESS LOSS OF RIGHTS.

Clifton McCann and Christopher Crook, Venable LLP, Washington, DC

A prior publication can inherently recite an invention and thus prevent a later claim for patent protection on the invention, even where the author of the publication did not understand or recognize the inherent disclosure. In this way water treatment patents have recently been invalidated. In other developments, the U.S. Supreme Court dramatically increased the standard for unobviousness in 2007, and the decision has been used by lower courts and the PTO to more frequently deny patent claims. However, for unpredictable arts such as water treatment, the standard has been largely restored to its pre-2007 state. This paper describes these developments and how they can be practically applied in an invention management program.

Discusser: *Richard Posa, Samco Technologies, Buffalo, NY*... 9:15 AM

Closure and Floor Discussion 9:25 AM

Beak..... 9:40 AM

WASTEWATER REUSE / RECYCLE IN THE FOOD & BEVERAGE INDUSTRY

Date: *Monday, October 5*

Time: *8:00-11:00 AM*

Room: *Salon III*

Cutting the intake and consumptive use of water supplies and limiting or eliminating the discharge of effluents to surface waters have become important priorities in the manufacturing sector, for environmental protection and bottom-line cost control reasons, and to meet sustainability goals. The food and beverage industry faces these pressures in terms of mandates to, among other measures, reuse and recycle wastewater, with particularly challenging barriers to overcome in terms of the high flow and strength of their wastewaters. This session will explore the innovative ways in which these barriers are tackled in achieving effluents and residuals that are suitable for reuse and recycling in both North and South America.

Session Chair: *Paul Pigeon, P.E., Golder Associates Inc., Lakewood, CO*

Discussion Leader: *Enos Stover, The Stover Group, Stillwater, OK*

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

MONDAY SESSIONS

PAPER: IWC 09-07

8:00 AM

TREATMENT OF HIGH STRENGTH WASTEWATER FROM A FOOD PROCESSING FACILITY - A CASE STUDY

**Shashi Gorur, Siemens Water Technologies, Warrendale, PA;
Robert Miller, Mariani Packing Company, Vacaville, CA**

On-site biological treatment system at a fruit processing facility is designed for 126,000 gpd (with expansion capability to 160,000 gpd) containing 20 g COD/L, 10 g BOD/L and 1.7 g TSS/L. This paper describes the treatment facility and presents results from 2½ years of operation since startup in November 2006.

Discusser: Brian Flynn, MRE Associates, Austin, TX..... 8:25 AM

Closure and Floor Discussion 8:35 AM

PAPER: IWC 09-08

8:50 AM

SUSTAINABLE REUSE OF WASTEWATER AND BIOSOLIDS FOR AGRICULTURE IN THE MANCHAY DISTRICT OF LIMA PERU

**Anton Callery, ITT Water and Wastewater, Peru SA,
Callao, Lima, Peru**

New discharge regulations in Peru have rapidly accelerated the growth of advanced biological processes in this strong emerging economy. This paper discusses a complete tertiary treatment plant including biosolids recovery for agricultural applications. This plant is currently being constructed and will go on line during the fourth quarter of 2009.

Discusser: Brent Cowan, CSC Technology, Inc.,

Coatesville, PA..... 9:15 AM

Closure and Floor Discussion 9:25 AM

Break..... 9:40 AM

PAPER: IWC 09-09

10:00 AM

BIOLOGICAL NITROGEN REMOVAL FROM CHEESE PLANT WASTEWATER USING AN ALTERNATE CARBON SOURCE

Pamela Edrich, Eric Blumenstein and Paul Pigeon Golder Associates Inc, Lakewood, CO; Joe Middlebrooks, Independent Consultant, Superior, CO; Sheldon Knapp and Douglas Pettinger, Glanbia Foods, Gooding, ID

A large cheese-making operation near Gooding, Idaho, generates on average 1.25 million gallons per day (MGD) of high strength wastewater. Wastewater is treated on-site and reused on agricultural land. This paper presents a study of nitrate removal (denitrification) by anoxic treatment using an alternate carbon source (a by-product of cheese-making).

Discusser: Michael Pudvay, Infilco Degremont,

Royal Oak, MI..... 10:25 AM

Closure and Floor Discussion 10:35 AM

Conclusion..... 10:50 AM

MONDAY SESSIONS

KEYNOTE SESSION

Date: *Monday October 5*
Time: *11:15 AM-12:15 PM*
Room: *Salons I-II*



This year's keynote session will feature David Klanecky, Global Research and Development (R&D) Director of Dow Water & Process Solutions, based in Edina, Minn. He is responsible for directing and conducting R&D programs related to Dow's water strategy and oversees the global technical service operations of the business. In this role, Klanecky oversees a team of 200 people in research centers across North America, Europe and Asia.

In addition, several awards of distinction will be presented during the Keynote Session by the IWC Executive Committee:

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 James Bellows of Siemens Energy, Inc. in Orlando, Florida. Mr. Bellows has been a long-time supporter of the IWC, and has been active as a presenter, discussor, session chair and discussor leader on many occasions.

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 69th IWC, in San Antonio, TX. We are pleased to present Robert D. Bartholomew of Sheppard T. Powell Associates, Baltimore Maryland. For: IWC 08-13, "An Introduction to Alkalinity Limits for Boiler Water Treatment" and Session Chair and discussor in the Panel on "Commissioning High Pressure Power Plants," which included papers #08-61 and #08-62.

JOSEPH A. LEVENDUSKY MEMORIAL SCHOLARSHIP

Each year Epicor, Inc., in cooperation with the International Water Conference® presents the Joseph A. Levendusky Memorial Scholarship in recognition of his contributions to the water treatment industry. For 2009 two awards will be presented during the Keynote Session to: Warren Wills, Georgia Institute of Technology; and Daniel Gregory, University of Delaware.

MONDAY SESSIONS

FIELD DATA/CASE STUDIES OF MEMBRANE TECHNOLOGIES: UF, MBR, EDI, RO

Date: *Monday, October 5*

Time: *1:30-6:00 PM*

Room: *Crystal Room*

Papers are presented discussing water treatment plants using ceramic membrane technology, fouling resistant membrane filtration system technology, and fractional electro deionization technologies. In addition, a paper discusses the control of calcium phosphate scaling in membrane applications by introducing new antiscalant chemistries instead of acid dosing or the use of conventional antiscalants

Session Chair: *Jantje Johnson, Genesys North America, Eden Prairie, MN*

Discussion Leader: *Arun Mittal, Aquatech International Corporation, Cannonsburg, PA*

IWC Representative: *Dan Rice, Sault Ste. Marie, MI*

PAPER: IWC 09-10

1:30 PM

INSTRUMENTATION AND CONTROLS NECESSARY TO PROPERLY MONITOR AND MAINTAIN THE HEALTH OF REVERSE OSMOSIS SYSTEMS.

Joe Vandehey and Ursula Johns, Burkert Fluid Control Systems, Irvine, CA

Reverse Osmosis systems have become a commodity in today's competitive market place. Element and pressure vessel costs are quite similar among today's manufacturers as are the high pressure pumps used on these systems. Competition and cost reductions have led many manufacturers to cut instrumentation and controls on these systems down to the bare minimum. This leaves the end user to fend for himself to properly monitor and maintain his system in good health. Today's Reverse Osmosis customer has the benefit of lower capitol costs, but many times this leads to higher maintenance & operating costs.

This seminar will focus on the necessary instrumentation and controls that allow an operator to properly monitor the health their Reverse Osmosis membranes. We will discuss various designs and the necessary parameters needed to normalize permeate flow and calculate mass balance equations thus helping the operator determine proper instrumentation calibration and system health.

Once a system is determined not to be operating as originally designed, we will discuss acceptable tolerances and how to use properly installed instrumentation to differentiate between a scaled membrane, and a fouled membrane do to 1) biological growth or 2) colloidal fouling. General cleaning techniques for each of the above situations will also be addressed.

In addition, this seminar will discuss high efficiency energy recovery technologies for Desalination Reverse Osmosis systems and the proper instrumentation and control valves necessary to maximize overall system efficiency.

Discusser: Jane Kucera, Nalco Company, Naperville, IL..... 1:55 PM

Closure and Floor Discussion 2:05 PM

MONDAY SESSIONS

PAPER: IWC 09-11

2:20 PM

CASE HISTORY OF A WTS IN PUERTO RICO

Steven Gagnon, AVANTech, Inc, Columbia, SC

This paper will review the lessons learned in designing, commissioning and operations a water treatment system consisting of a depth filters, antiscalant feed, and cartridge filters as pretreatment, followed by a single pass reverse osmosis system and polished with a single pass electrodeionization system for a 300 MW, combine cycle co-generation power plant in Puerto Rico. This paper shall provide background on equipment selection, unit operation, water quality issues, system rework, operation problems, system profiling and validation protocol.

Discusser: Jonathan Wood, Siemens Water Technologies,

Lowell, MA..... 2:45 PM

Closure and Floor Discussion 2:55 PM

PAPER: IWC 09-12

3:10 PM

PREVENTION OF CALCIUM PHOSPHATE FOULING IN WASTE WATER RE-USE RO PLANT.

Stephen P. Chesters, Fernando Del Vigo and Edward G. Darton, Genesys International Limited, Winsford, Surrey, UK

Waste water contains high levels of phosphate typically 10-30 mg/l which causes calcium phosphate scale formation in reverse osmosis membranes. Conventional antiscalant chemistry and dosing large quantities of acid is ineffective in high phosphate waste waters. This paper investigates the chemistry and morphology of calcium phosphate. Highly active calcium phosphate threshold inhibitors were tested in the laboratory and a development product Genesys PHO (Antiscalant B) formulated which significantly outperformed conventional antiscalants and acid dosing in three case studies.

Discusser: Scott Beardsley/Gregg Poppe, Dow Water & Process

Solutions, Minneapolis, MN 3:35 PM

Closure and Floor Discussion 3:45 PM

Break..... 4:00 PM

PAPER: IWC 09-13

4:15 PM

USE OF UNIQUE FRACTIONAL ELECTRO DE-IONIZATION IN POWER PLANT APPLICATION

Devesh Mittal and VJ Nathan, Aquatech International Corporation, Canonsburg, PA

In recent years use of EDI (Electro De-Ionization) has seen its acceptance diminish as part of demineralization systems at power plants. The paper will discuss the application of FEDI (Fractional Electro De-Ionization) in production of demineralized water at a merchant power plant in Texas. The paper will present operating data and operating experience to demonstrate significant improvements made over the conventional EDI by overcoming hardness scaling, energy conservation and ion removal efficiency, in essence promoting wider acceptability with the achieved patented improvements in EDI module construction and operation.

Discusser: Avijit Dey, Ph.D., Bechtel Corporation,

Houston, TX 4:40 PM

Closure and Floor Discussion 4:50 PM

MONDAY SESSIONS

PAPER: IWC 09-14

5:05 PM

THE HYBRID CERAMIC MEMBRANE FACILITIES IN WTP

Bum-soo Choi, Lee Soo Yoon, Dong Sun Shin K-water, Daejeon, South Korea

Yon-cho Water Treatment Plant has to be retrofitted as it is 30 years old and cannot meet demands both quality and quantity. The paper discusses pilot tests of two water treatment processes. One process consists of ozone treatment, flocculation, microfiltration and GAC while the second process consists of flocculation and microfiltration. The results of the pilot tests enabled the authors to select the water treatment process for Yon-cho WTP.

Discusser: Arun Mittal, Aquatech International Corporation, Canonsburg, PA 5:30 PM
Closure and Floor Discussion 5:40 PM
Conclusion 5:55 PM

APPLICATION OF WATER TREATMENT TECHNOLOGIES TO OPERATING AND NEW NUCLEAR PLANTS

Date: Monday, October 5

Time: 1:30-4:00 PM

Room: Salon I

Nuclear plants-old or new- require cutting edge technologies to increase operating efficiencies. This session addresses three different applications, one on resin technology used at an existing nuclear facility, the other on future environmentally-friendly inhibitors for large cooling towers, and the third on meeting cycle chemistry requirements for the new breed of light water reactors. The three papers collectively send a message that the water treatment industry is ready for the new nuclear generating facilities.

Session Chair: Joseph Williams, Exelon Corp., Chicago, IL

Discussion Leader: Sandy Schexnailder, GE Water & Process Technologies, Dallas, TX

IWC Representative: Kumar Sinha, P.E., Bechtel Power, Frederick, MD

PAPER: IWC 09-15

1:30 PM

WELL, HOW LONG IS IT GONNA TAKE?

Amardeep Venus Kaur, Southern California Edison, Westminster, CA

This paper presents preliminary work done in the SCE corporate chemical laboratory to find a solution to the constantly increasing silica in the Refueling Water Storage Tank (RWST). It provides data on a unique iron impregnated ion exchange resin and discusses its silica removal properties. It further looks at a new strategy, a loop process which was designed to take advantage of resin's absorption process.

Discusser: 1:55 PM
Closure and Floor Discussion 2:05 PM

MONDAY SESSIONS

PAPER: IWC 09-16

2:20 PM

CYCLE CHEMISTRY CHALLENGES FACING THE NEW GENERATION OF NUCLEAR POWER FACILITIES

Earnestine Johnson, Jeanette Shoemaker, Christopher Huth, and Kumar Sinha, P.E., Bechtel Power Corporation, Frederick, MD

With global power producers looking towards greener methods of electricity production aside from the traditional fossil fuels, the possibility of new nuclear facilities in the US is rapidly becoming a reality. Several new nuclear reactor designs are in various stages of approval with the US Nuclear Regulatory Commission and awaiting final design acceptance. Based on the details of the new reactor designs, Engineering, procurement and Construction (EPC) companies and potential owners are facing a new generation of nuclear cycle chemistry challenges

Discusser: Sandy Schexnailder, GE Infrastructure Water & Process

Technologies, Dallas, TX 2:45 PM

Closure and Floor Discussion 2:55 PM

PAPER: IWC 09-17

3:10 PM

MEETING ENVIRONMENTAL AQUATIC CHALLENGES FOR THE NEXT GENERATION OF NUCLEAR PLANT CONSTRUCTION

Raymond Post P.E., Richard Tribble, and Helen Cerra, ChemTreat, Inc., Glen Allen, VA; Tony Banks, Dominion Virginia Power, Glen Allen, VA

Developers of the next generation of nuclear power plants are proud to achieve the very highest standards for clean and safe energy production. These standards encompass not only passive nuclear safety and zero carbon footprint, but also unprecedented EH&S standards including zero aquatic impacts with respect to thermal and chemical emissions. This paper provides a brief overview of the emerging aquatic environmental standards and reports on laboratory pilot scale evaluations to develop the technology necessary to achieve them. Data from the studies will be presented and discussed in detail with respect to performance and environmental effects. The results of the studies demonstrate that effective control of corrosion and deposition in open recirculating cooling systems is both achievable and practical using chemistry that contributes no phosphorous and zinc to the environment and is safe for aquatic life.

Discusser: Colleen Layman, Bechtel, Frederick, MD..... 3:35 PM

Closure and Floor Discussion 3:45 PM

Conclusion 4:00 PM

MONDAY SESSIONS

CURRENT TRENDS IN REFINERY WASTEWATER TREATMENT

Date: Monday, October 5
Time: 1:30-6:00 PM
Room: Salon II

The process-intensive refining and petrochemical industry has demanding environmental challenges to protect water, soil and atmosphere. Wastewater from the refinery and petrochemical plants contains hazardous chemicals such as hydrocarbons, phenol, amines, ammonia nitrogen, BTEX compounds, bio-refractory contaminants, heavy metals, total dissolved solids and many other hazardous materials.

This session presents the current trends in refinery wastewater treatment such as - using circular oil/water separators instead of traditional rectangular API Separators; cost effective technologies for treating desalter wastewater from refineries using heavy Canadian tar sands crude; economic/regulatory drivers for wastewater treatment, recycle and reuse; advances in selenium treatment and removal technologies; and challenges in on-line measurement and analysis of oil and grease.

Session Chair: Ramesh Kalluri, P.E., Kalluri Group, Inc., Houston, TX
Discussion Leader: Donald Vacker, P.E., Bechtel Corporation, Houston, TX
IWC Representative: James Dromgoole, Fort Bend Services, Inc., Stafford, TX

PAPER: IWC 09-18

1:30 PM

SELENIUM REMOVAL FROM REFINERY WASTEWATER

Avijit Dey, Ph.D., and Rajendra Kulkarni, Bechtel, Houston, TX

Selenium is a naturally occurring trace mineral found in crude oil. Its presence in high concentrations in water can impact aquatic habitats. A suspected carcinogen, selenium is also harmful to fish and fowl when present in waste waters. The present study comprises a comprehensive survey of the various methods and technologies currently used for selenium removal and their technical limitations for the treatment of refinery waste water.

Discusser: John Lucey, Jr., P.E., HDR, Pittsburgh, PA 1:55 PM

Closure and Floor Discussion 2:05 PM

PAPER: IWC 09-19

2:20 PM

CIRCULAR API SEPARATORS IN REFINERY SERVICE

Mike Bradford and Shaun Kusek, Ph.D., Jacobs Consultancy, Houston, TX

Refineries have historically used rectangular APIs for oil water separation. However, circular APIs have a number of advantages including improved solids handling and reliability. This paper provides information on the performance of existing circular APIs and provides suggestions for design improvements and sizing units.

Discusser: James Woods, WesTech Engineering,

Salt Lake City, UT 2:45 PM

Closure and Floor Discussion 2:55 PM

MONDAY SESSIONS

PAPER: IWC 09-20

3:10 PM

OIL-IN-WATER FLUORESCENCE SENSOR IN INDUSTRIAL WASTE WATER APPLICATIONS

Vadim Malkov, Hach Company, Loveland, CO; Dietmar Sievert, Hach Lange GmbH, Duesseldorf, Nordrhein-Westfale, Germany

In order to simplify and accelerate the analyses of oil and grease in industrial wastewaters, particularly discharged from various parts of the oil-refining process, a UV-fluorescent sensor sensitive to PAH was tested. The correlation between total oil-in-water concentration and the model compound is achievable in samples containing stable oil content.

Discusser: Donald Vacker, P.E., Bechtel Power Corporation, Houston, TX.....

3:35 PM

Closure and Floor Discussion

3:45 PM

Break.....

4:00 PM

PAPER: IWC 09-21

4:15 PM

REFINERY AND HEAVY OIL PRODUCTION WASTEWATER RECYCLE AND REUSE

Mike Bradford, Jacobs Consultancy, Houston, TX; Ian Buchanan, Jacobs Consultancy Canada, Calgary, Canada; Ian Moore, Jacobs Consultancy UK Ltd, London, England

Water has become a scarce resource in some areas and expensive in others. This paper provides information on historical water consumptions and approaches refinery and heavy oil facilities have been successfully using to recycle and re-use wastewater.

Discusser: Paul Wood, P.E., Lockwood, Andrews & Newnam, Inc., Houston, TX.....

4:40 PM

Closure and Floor Discussion

4:50 PM

PAPER: IWC 09-22

5:05 PM

DESALTER WASTEWATER TREATMENT FROM REFINERIES USING CANADIAN HEAVY CRUDE AS FEED STOCK

Rafique Janjua, Fluor Engineering Corporation, Sugar Land, TX

Refineries using Heavy Canadian Crude from tar Sands as feed stock produces Desalter waste stream which can very high in oil and emulsion. COD loading to the receiving wastewater treatment can be high. This will exert shock loading to the existing oil water separation system as well as existing biochemical treatment resulting in NPDES excellence. This paper will discuss how this can be mitigated effectively and economically better than any existing technology.

Discusser: Bill Moore, Aquatech International Corporation, Canonsburg, PA.....

5:30 PM

Closure and Floor Discussion

5:40 PM

Conclusion.....

5:55 PM

MONDAY SESSIONS

SEMI-CONDUCTOR / HIGH PURITY WATER / ULTRAPURE WATER (PHARMA/ELECTRONICS)

Date: Monday, October 5

Time: 4:00-6:00 PM

Room: Salon I

This session will focus on different but important areas of high purity water treatment design and operation. Ten (10) years of operating experience using ozone for the reduction of contaminants in a high-purity water system will be reviewed. The events associated with a variable municipal feed water supply will be discussed along with system modifications required to meet the stringent process water requirements. Data associated with system operation will be presented for trihalomethane (THM) reduction as well as microbial and endotoxin control. The effect of ozone on rouge formation of the stainless steel system components and system passivation intervals will also be presented. The other area of focus is the current development of new modeling tools for selection of the best unit operations for production of high purity water. The modeling consists of pretreatment, ion exchange, reverse osmosis, electro dialysis reversal, electro-deionization and thermal evaporation systems. These modeling tools reduce the costly and time-consuming process of evaluating the merits of one technology or design over another. The new tools illustrate that several of the old "rules of thumb" which have guided process engineers in selecting technologies can be replaced with faster and better ways to select the right technology solutions.

Session Chair: Steven R. Gagnon, AVANTech, Inc.,
Columbia, SC

Discussion Leader: Erin Imler, Imler Equipment, Inc, Exton, PA

IWC Representative: Bradley Wolf, Navigant Consulting,
Pittsburgh, PA

PAPER: IWC 09-23

4:00 PM

TECHNO-ECONOMIC MODELING TOOLS FOR PRODUCTION OF HIGH PURITY WATER

**Roch Laflamme, GE Water and Process Technologies, Trevose,
PA; Robert Gerard, GE Water and Process Technologies.
Surhuisterveen, FR, Netherlands**

The wide range of water treatment technologies available today provides an interesting challenge when trying to find the best series of unit operations and optimize total system performance. To address these issues for the production of boiler feed water, we have developed a range of tools that allow for a quick evaluation of key factors for both new projects as well as system upgrades. These tools allow evaluation of pretreatment options, softening, ion exchange (IX), ultrafiltration (UF), reverse osmosis (RO), electrodeionization (EDI) and various combinations. This paper is focuses on comparing membranes with ion exchange technologies for the production of high purity water. The RO-EDI/Demin-MB tool was used to do a sensitivity study looking at the break-even point when varying the major parameters affecting the capital and operating cost

**Discusser: Gregory Osen, Christ Water Technology Americas, LLC,
New Britain, CT..... 4:25 PM**

Closure and Floor Discussion 4:35 PM

MONDAY SESSIONS

PAPER: IWC 09-24

4:50 PM

CONTAMINANT REDUCTION BY OZONE TREATMENT FOR A HIGH-PURITY INDUSTRIAL APPLICATION

Andrew W. Collentro, Water Consulting Specialists, Inc., Plymouth, MA

This presentation will discuss ten years of operating experience with the use of ozone for reduction of contaminants in a high-purity water system. The chronological events associated with a variable municipal feed water supply will be discussed along with system modifications required to meet the stringent process water requirements.

Discusser: Barbara Schilling, Degremont Technologies, Elmwood Park, NJ..... 5:15 PM
Closure and Floor Discussion 5:25 PM
Conclusion..... 5:40 PM

ZERO LIQUID DISCHARGE (ZLD) SOLUTIONS

Date: Monday, October 5

Time: 1:30-4:00PM

Room: Salon III

Due to increasing strict regulations more industries are prohibited from discharging waste water originating from their plants. This session will cover ZLD technologies which will address this compliance challenge including recycle and reuse of treated waste water.

Session Chair: Michael Preston, Black & Veatch, Overland Park, KS

Discussion Leader: Patricia M. Scroggin, P.E., Burns & McDonnell, Kansas City, MO

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

PAPER: IWC 09-25

1:30 PM

FIRST THERMAL ZERO LIQUID DISCHARGE (ZLD) SYSTEM IN CHINA

Bruce D. Kasnitz, Gregg Wilson and Robert Solomn, GE Water & Process Technologies, Bellevue, WA

This paper describes the design of the first commercial coal liquefaction ZLD wastewater system in China. Due to heightened awareness of environmental impacts and benefits of wastewater recovery/recycling, the Chinese government and Owners themselves are actively looking at ZLD systems to treat various plant wastewaters.

Discusser: Diane Martini, Sargent and Lundy, Chicago, IL.... 1:55 PM
Closure and Floor Discussion 2:05 PM

MONDAY SESSIONS

PAPER: IWC 09-26

2:20 PM

ZERO DISCHARGE AT GM SAN LUIS POTOSI AUTOMOTIVE COMPLEX

Lawrence V. Krzesowski, General Motors Corp, Warren, MI, LNSP Nagghappan and David E. Parker, N.A. Water Systems, a Veolia Water Solutions & Technologies Company, Moon Township, PA

General Motors Corporation has built a “zero liquid discharge” wastewater treatment facility to support a Greenfield Automotive Complex in Mexico. The facility produces potable water and process water for various manufacturing operations and treats wastewater for recycle/reuse. The wastewater treatment facility consists of pretreatment technologies for removal of oil & grease, metals and organics, followed by an end-of-pipe system for sustainable reuse of the wastewater as process water. This paper will discuss the performance of the OPUS™ technology used in the end-of-pipe treatment system.

Discusser: David Velegol, Chester Engineers,

Moon Township, PA..... 2:45 PM

Closure and Floor Discussion 2:55 pm

PAPER: IWC 09-27

3:10 PM

EVALUATION OF REVERSE OSMOSIS, ORGANIC TRAP RESIN, AND ACTIVATED CARBON BED FOR ORGANIC REMOVAL FROM AN EVAPORATOR DISTILLATE WATER. A CASE STUDY FROM A ZERO-WATER DISCHARGE POWER PLANT WITH SURFACE AND GRAY WATER SOURCES

Emmanuel Quagraine, Shand Power Station, SaskPower, Estevan, SK, Canada; Keith Hill and Fredrick Omorogbe, SaskPower-Engineering Services, Regina, SK, Canada

In a case study for a Zero Water Discharge Plant drawing on treated sewage and surface water for cooling, the performance of pilots of two recommended organic removal techniques (i.e. reverse osmosis and organic trap resin) were compared to existing activated carbon bed for organic removal prior to mixed beds.

Discusser: Anthony Selby, Water Technology Consultants, Inc.,

Evergreen, CO..... 3:35 PM

Closure and Floor Discussion 3:45 PM

Conclusion..... 4:00 PM

TUESDAY SESSIONS

HRSG & BOILER TUBE FAILURE (BTF) MECHANISMS, ANALYSES, & CORRECTIVE MEASURES. PRESENTATIONS & PANEL DISCUSSION SPONSORED BY THE ASME RESEARCH AND TECHNOLOGY COMMITTEE ON WATER & STEAM IN THERMAL SYSTEMS

Date: Tuesday, October 6

Time: 8:00 AM-Noon

Room: Crystal Room

This panel presents case studies and discusses the mechanisms, contributing factors, and failure analyses methods for some of the most prevalent types of boiler/HRSG tube failures including underdeposit corrosion (e.g., phosphate gouging), hydrogen damage, flow accelerated corrosion (FAC), oxygen attack, overheating/creep, and corrosion/thermal fatigue. Nondestructive testing, chemistry controls, and other means of avoiding tube failures, also are discussed. An open-floor discussion will follow, enabling attendees to present comments or questions to the panel and to receive helpful responses.

Session Chair: Robert Bartholomew, Sheppard T. Powell Associates LLC, Baltimore, MD

Discussion Leader:

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

REPORT: IWC 09-28

8:00 AM

IMPACT OF FEEDWATER AND CONDENSATE RETURN EXCURSIONS ON BOILER SYSTEM COMPONENT FAILURES

Mel Esmacher, GE Water & Process Technologies, The Woodlands, TX; Anthony Rossi, GE Water & Process Technologies, Trevose, PA

During boiler operation, the transport of contaminants in boiler feedwater or condensate return, such as hardness excursions or metal oxides due to corrosion, can cause fouling and subsequent tube failure due to under-deposit corrosion or overheating. Case histories will be reviewed and suitable corrective actions discussed.

Discusser: 8:25 AM

Closure and Floor Discussion: 8:35 AM

REPORT: IWC 09-29

8:50 AM

HRSG FAC

Bill Boyd and Mark Vogt, Dynege Generation, O'Fallon, IL

Industry FAC concerns and issues related to HRSG tube failures are highlighted. Different chemical treatment approaches used to combat FAC and the approach Dynege is using to combat FAC are discussed.

Discusser: 9:15 AM

Closure and Floor Discussion 9:25 AM

TUESDAY SESSIONS

REPORT: IWC 09-30

9:40 PM

OXYGEN CORROSION AND CORROSION FATIGUE BOILER TUBE FAILURE CASE HISTORIES

Ewa Labuda and Robert Bartholomew, Sheppard T. Powell Associates, LLC, Baltimore, MD

Corrosion mechanisms associated with dissolved oxygen in the absence or presence of cyclic stresses are discussed. Case studies involving waterwall and economizer tubes from conventional boilers, a feeder pipe for a lower header in a package boiler and an economizer tube from a heat recovery steam generator (HRSG) are presented. Each tube was affected by corrosion and/or cracking initiated on the waterside surface. The cracking was associated with cyclic stresses (either thermal or mechanical). Results of visual examination, elemental analysis of waterside buildup, and optical metallography are provided. The effects of cyclic stresses on the crack morphology are discussed.

Discusser: 10:05 AM

Closure and Floor Discussion 10:15 AM

Break..... 10:40 AM

REPORT: IWC 09-31

11:00 AM

A REVIEW OF HYDROGEN DAMAGE AND PHOSPHATE GOUGING CORROSION MECHANISMS

David Daniels, M&M Engineering Associates Inc., Austin, TX

A significant number of boiler waterwall tube failures are caused by under-deposit corrosion mechanisms. This paper will provide both a historical perspective and the current understanding of two under-deposit corrosion mechanisms: hydrogen damage and phosphate gouging. It will also discuss how recommended treatment practices have been changed to minimize corrosion by these mechanisms in the future.

Discusser: 11:25 AM

Closure and Floor Discussion 11:35 AM

Conclusion..... 11:50 AM

TUESDAY SESSIONS

WATER & WASTEWATER MANAGEMENT IN POWER PLANT FGD SYSTEMS – PART I

Date: Tuesday, October 6
Time: 8:00 AM-Noon
Room: Salon I

Flue gas desulfurization (FGD) systems are designed to control atmospheric sulfur dioxide emissions by removing SO₂ in a gas-liquid contact absorber using an aqueous slurry made from lime or limestone dissolution. As water-based systems, the trouble-free operation of scrubbers depends upon effective makeup quality selection and reliable chemistry monitoring. In addition, the ability of FGD systems to remove flue gas constituents other than sulfur dioxide (particularly certain trace elements) may also result in scrubber wastewater treatment and discharge implications. This two-part session includes papers that examine all of these water and wastewater management issues in power plant FGD systems.

Session Chair: Danny Johnson, Progress Energy, Raleigh, NC

Discussion Leader:

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

PAPER: IWC 09-32

8:00 AM

SOURCE WATER CHALLENGES FROM THREE FGD MAKEUP WATER SYSTEMS

Thomas Lawry, HDR Engineering, Inc, Pittsburgh, PA

This presentation describes challenges faced by three FGD makeup water systems. Facility #1 pulls high quality stream water requiring only clarification and filtration. Facility #2 utilizes sanitary treatment effluent requiring further treatment, including chlorination, filtration, and ultraviolet disinfection. Facility #3 uses brackish water requiring desalination with solids removal.

Discusser: 8:25 AM

Closure and Floor Discussion: 8:35 AM

PAPER: IWC 09-33

8:50 AM

MONITORING THE CHLORIDE LEVEL IN WET FGD ABSORBERS WITH AN ON-LINE CONDUCTIVITY TRANSMITTER

John J. Kim, P.E., Ph.D., JJK Water Technology, Inc., Sneads Ferry, NC; Robbin M. Jolly, Duke Energy Corp, Belmont, NC

Monitoring of chloride level in the WFGD absorber is important because a high chloride concentration attacks the alloy material which the absorber vessel is made of. This paper discusses the relationship between the conductivity and the chloride concentration in the absorber where many interfering chemical species are present.

Discusser: 9:15 AM

Closure and Floor Discussion: 9:25 AM

TUESDAY SESSIONS

PAPER: IWC 09-34

9:40 AM

INTERCOMPARISON OF DIFFERENT TECHNOLOGIES FOR THE QUANTITATION OF TOTAL MERCURY IN COMPLEX WASTE STREAMS

Russell Gerads, and Jacob Meyer, Applied Speciation and Consulting, LLC, Tukwila, WA

Multiple methods promulgated by the EPA for compliance monitoring of mercury in wastewater discharge were investigated and compared to cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS). This study was performed to identify the limitations and benefits associated with each analytical method and how varying waste streams can induce method failures.

Discusser: 10:05 AM

Closure and Floor Discussion: 10:15 AM

Break..... 10:40 AM

PAPER: IWC 09-35

11:00 AM

TRACE MERCURY REMOVAL FROM FGD WASTEWATER

Mark Owens, Infilco Degremont, Inc., Richmond, VA; H. Robert Goltz, Ph.D., The Dow Chemical Company, Midland, MI; Dean Mingee, Robert Kelly, Ph.D., Degremont North American Research & Development, Richmond, VA

Discharges from Wet FGD Systems are facing new, very stringent, effluent limitations for mercury. The Dow Chemical Company and Infilco Degremont, Inc. have developed an end-of-pipe system to remove trace mercury contamination to <12 parts per trillion. This report will present the results of a successful pilot test performed in 2008.

Discusser: 11:25 AM

Closure and Floor Discussion: 11:35 AM

Conclusion..... 11:50 AM

PRODUCED WATER

Date: Tuesday, October 6

Time: 8:00-10:30 AM

Room: Salon II

This session offers a global perspective of produced water initiatives and issues and will include data generated in the field as well as lab studies. Specific to the North American market, a paper will present data from studies performed at a Steam Assisted Gravity Drainage (SAGD) bitumen production facility in northern Alberta, Canada including aspects of water chemistry critical to system reliability. A second paper reviews a pilot study to be generated in U.S. though the intended installation will be the Liaohe Oilfield in China. This paper will discuss the feasibility and economics of treating SAGD produced water by a MVC evaporator. The third paper presents one year operating data from a produced water plant in Equatorial Guinea, Africa and their utilization of biological treatment to meet World Bank Environmental guidelines for ocean discharge.

Session Chair: Michael Sheedy, Eco-Tec Inc., Pickering, Ontario

Discussion Leader: Rudy Tamayo, Husky Energy, Calgary, AB

IWC Representative: James Sabzali, Thermax Inc., Novi, MI

TUESDAY SESSIONS

PAPER: IWC 09-36

8:00 AM

STEAM PRODUCTION USING PRODUCED WATER: LESSONS LEARNED

Martin Godfrey, Nalco Company, Naperville, IL

Produced water presents challenges for high pressure steam production. Silica causes mineral scale formation on boiling surfaces. Volatile components not present in convention boiler water distribute throughout the system. Field data on silicate scale formation and the distribution of volatile components in various Steam Assisted Gravity Drainage systems are presented.

Discusser: Melonie Myszczyzyn, Canadian Natural Resources Ltd.,

Bonnyville, AB, Canada 8:25 AM

Closure and Floor Discussion 8:35 AM

PAPER: IWC 09-37

8:50 AM

SAGD FIT FOR PURPOSE BOILER FEEDWATER SPECIFICATION FROM EVAPORATOR DISTILLATE

Keith Minnich, Veolia Water Solutions & Technologies/VWS Oil & Gas, Calgary, AB, Canada, Dorothy Neu, Veolia Water Solutions & Technologies/HPD, Pewaukee, WI; J. Luke Drone, Veolia Water Solutions & Technologies/HPD, Plainfield, IL

Evaporation of produced water has been used at several SAGD facilities to produce boiler feed water. There are no official guidelines for the required quality of evaporator distillate to feed an OTSG or drum boiler that will produce injection steam. This paper presents a basis for a fit for purpose specification. This paper also presents data on the performance of a Vapor Washer, which produces high quality distilled water to meet the fit for purpose specification.

Discusser: Sudhir Parab, ConocoPhillips Canada Limited, Calgary,

AB, Canada..... 9:15 AM

Closure and Floor Discussion 9:25 AM

PAPER: IWC 09-38

9:40 AM

A CASE STUDY: PROCESS EVALUATION, DESIGN, CONSTRUCTION, AND START-UP OF A PRODUCED WATER TREATMENT PLANT IN EQUATORIAL GUINEA, AFRICA

Brian Huff and Eric Blumenstein, Golder Associates Inc., Lakewood, CO,

A produced water treatment plant was designed at a natural gas plant in Equatorial Guinea, Africa to treat produced water to meet World Bank Environmental Guidelines for ocean discharge. Contaminants included high levels of chemical oxygen demand and biochemical oxygen demand (4,000 and 2,000 mg/l, respectively), oil and grease, methanol, glycol, and phenol.

Discusser: 10:05 AM

Closure and Floor Discussion 10:15 AM

Conclusion..... 10:30 AM

TUESDAY SESSIONS

IMPROVING SUSTAINABILITY THROUGH WATER REUSE AND CONSERVATION

Date: Tuesday, October 6

Time: 8:00-10:30 AM

Room: Salon III

World-wide concerns related to the scarcity of fresh water resources have prompted industrial facilities to focus their efforts more intensely on water reuse, recycle, and conservation measures. This session will discuss innovative methods and technologies employed at power plants, paper mills, and other industrial facilities to optimize water management practices through wastewater treatment and reuse.

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

Discussion Leader: Diane Martini, Sargent & Lundy, LLC, Chicago, IL

IWC Representative: Kumar Sinha, P.E., Bechtel Power, Frederick, MD

PAPER: IWC 09-39

8:00 AM

INNOVATIVE WATER REUSE: SUSTAINABLE WATER MANAGEMENT AND CONSERVATION USING ADVANCED (HYBRID) COOLING TECHNOLOGIES

Peter Demakos, P.E., and Chris Imiola, Niagara Blower Heat Transfer Solutions, Buffalo, NY

This paper will demonstrate that closed-loop, evaporative systems not only are cost-effective but also allow for water conservation strategies and reduced carbon footprint. These versatile systems can be used in industries including process, food & beverage, refining, and power. Applications include fluid cooling, vapor condensing, and first stage evaporation upstream of ZLD systems.

Discusser: Jeff Mallory, Sargent, Berwyn, IL 8:25 AM

Closure and Floor Discussion 8:35 AM

PAPER: IWC 09-40

8:50 AM

INNOVATIVE ION EXCHANGE SYSTEMS FOR COST-EFFECTIVE INCREASE IN WATER RE-USE IN POWER PLANTS

Michael Bratty, David Sanguinetti, Songlin Ye, and Teryl Murray BioteQ Environmental Technologies Inc., Vancouver, BC, Canada

The power generation industry is adopting water conservation and recycling measures in order to address concerns about water usage and rising overall costs of water including the treatment of input water and wastewater streams. As a result of water conservation and re-use, dissolved solids (TDS) including Ca, Mg, SO₄, and Cl tend to accumulate in the main process streams including cooling and utility water, ash pond water, and FGD wastewater. Rising levels of Ca, Mg, and SO₄ limit the extent of water re-use by affecting the scaling potential of process water while dissolved Ca, Mg chlorides increase the boiling point of waste liquors treated in ZLD evaporator-crystallizer systems leading to major increases in power consumption and capital cost of ZLD systems.

Discusser: Stephen Dominick, Siemens Water Technologies Corp., St. Charles, IL 9:15 AM

Closure and Floor Discussion 9:25 AM

TUESDAY SESSIONS

PAPER: IWC 09-41

9:40 AM

TOXIC DISSOLVED AND DISPERSED HYDROCARBON REMOVAL IN INDUSTRIAL WASTEWATER AND POLLUTED GROUNDWATER WITH THE MACRO POROUS POLYMER EXTRACTION TECHNOLOGY AND REUSE OF THIS WATER FOR INDUSTRIAL PURPOSES BY VEOLIA WATER

Dick Meijer, VWS Oil & Gas, a Veolia Water Company, Celsiusstraat 34, The Netherlands; Kenneth Severing, Whittier Filtration, Veolia Water Solutions & Technologies, Santa Fe Springs, CA,

The trend to more severe discharge requirements and to polluted groundwater treatment pushed by governments and followed by industries goes together with the development of more advanced water treatment technologies. Nowadays these requirements have gained such high standards that one step further to contaminated water reuse becomes attractive, especially in areas where fresh water is scarce or very expensive. In such cases innovative technologies with high separation performances are particularly attractive.

Discusser: Edward Carr, Buckman USA, St. Charles, MO..... 10:05 AM

Closure and Floor Discussion 10:15 AM

Conclusion 10:30 AM

ASPECTS OF CYCLE CHEMISTRY CONTROL IN FOSSIL-FUELED STEAM GENERATION SYSTEMS, A PANEL DISCUSSION SPONSORED BY THE ASME RESEARCH AND TECHNOLOGY COMMITTEE

Date: Tuesday, October 6

Time: 1:30-4:00 PM

Room: Crystal Room

This informative panel will discuss treatment programs to prevent corrosion and scale in boiler systems using high purity feedwater. We will discuss various treatment programs, including the use of organic treatment chemicals, for boilers and Heat Recovery Steam Generators and examine new approaches in the use of particle counts and ORP for monitoring corrosion and metals transport continuously in the boiler system. The subsequent open-floor discussion period will allow ample time for attendees to receive responses to their comments and questions about real-time boiler operations.

Session Chair: Deborah Bloom, Nalco Company, Naperville, IL

Discussion Leader:

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

REPORT: IWC 09-42

1:30 PM

THE IMPACT OF OXIDIZING ENVIRONMENT ON FEEDWATER CORROSION AND METAL TRANSPORT - NEW TOOLS AND FINDINGS

Daniel C. Sampson, Nalco Company, Vallejo, CA; James Moen, Roseville Energy Park, Roseville, CA

This paper analyzes the impact of oxidizing environment on feedwater corrosion and metal transport by examining the oxidizing environment at different locations using

TUESDAY SESSIONS

two new tools: At-Temperature ORP (AT ORP) and Particle Analysis. Initial findings indicate that variability in the oxidizing environment is as important as ORP for corrosion control.

Closure and Floor Discussion 1:50 PM

REPORT: IWC 09-43 2:00 PM

REAL-TIME CORROSION PRODUCT TRANSPORT MONITORING USING ON-LINE PARTICLE MONITORS

Joe Zimmerman and John Manganaro, CHEMTRAC Systems, Inc, Norcross, GA

This paper is meant to introduce the Particle Monitor as an effective means for continuously sensing and tracking Corrosion Product Transport (CPT). Transient metal oxides, in their insoluble particulate form, can be detected with the particle monitor. When such CPT monitoring methods are utilized, real-time particulate measurement can be implemented as an additional core parameter for operating and controlling the power plant cycle.

Closure and Floor Discussion 2:20 PM

REPORT: IWC 09-44 2:30 PM

CYCLE CHEMISTRY PROGRAMS AND CONTROL IN HIGH AND MEDIUM PRESSURE BOILERS

K. Anthony Selby, Water Technology Consultants, Inc., Evergreen, CO

Cycle chemistry programs must control corrosion and deposition in both the feedwater system and in the boiler. The chemistry programs must be robust and flexible to handle normal operation, including start-ups and shut-downs, and upsets. Treatment programs for high pressure systems include all volatile treatment (AVT) and oxygenated treatment (OT) as well as several variations of phosphate and/or caustic chemistry. Treatment programs for medium pressure systems may also include a polymeric dispersant component or a polymer-based program.

Closure and Floor Discussion 2:50 PM

Break..... 3:00 PM

REPORT: IWC 09-45 3:20 PM

ORGANIC CHEMICAL TREATMENT OF HIGH PURITY BOILER FEEDWATER – WHY THE FUSS?

James Robinson, GE Infra, Water, Trevose, PA; Robin Kluck and Anthony Rossi, GE Water and Process Technologies, Trevose, PA; Luis Carvalho, GE Water and Process Technologies, Mississauga, ON Canada

Organic chemicals have been used to treat high purity boiler feedwater for decades. Notable benefits have been derived from these chemicals, however many consider their use to be risky. What are the facts? The advantages and limitations of organic chemicals are presented to help plant operators assess the potential value of using organic chemicals in their systems.

Closure and Floor Discussion 3:50 PM

Conclusion..... 4:00 PM

	CRYSTAL ROOM	SALON I	SALON II	SALON III
SUNDAY, OCTOBER 4				
5:00-7:00 PM	GET ACQUAINTED RECEPTION IN THE EXHIBIT HALL - INTERNATIONAL BALLROOM			
MONDAY, OCTOBER 5				
8:00-11:00 AM	INDUSTRIAL WATER TREATMENT	TRACE CONTAMINANT REMOVAL	TRACE CONTAMINANT REMOVAL	WATER REUSE IN THE FOOD & BEVERAGE INDUSTRY
11:15 AM		KEYNOTE SESSION	KEYNOTE SESSION	
12:00-7:00 PM	EXHIBIT HALL HOURS (LUNCHEON BUFFET 12:15-1:30) - INTERNATIONAL BALLROOM			
1:30-6:00 PM	FIELD DATA STUDIES OF MEMBRANES MBR, EDI, RO	WATER TREATMENT IN NUCLEAR POWER PLANTS	CURRENT TRENDS: IN REFINERY WASTE-WATER TREATMENT	ZERO LIQUID DISCHARGE, SOLUTIONS
4:00-6:00 PM		SEMI-CONDUCTOR/ULTRAPURE WATER		
5:00-7:00 PM	WELCOME RECEPTION IN THE EXHIBIT HALL - INTERNATIONAL BALLROOM			

TUESDAY SESSIONS

COOLING WATER REUSE/ENERGY CONSERVATION

Date: Tuesday, October 6

Time: 1:30-5:00 PM

Room: Salon II

This session is an extension of the morning session and continues to discuss new approaches to managing and controlling cooling systems in an environmentally friendly and efficient manner.

Session Chair: Arthur Freedman, Arthur Freedman & Associates, Inc., East Stroudsburg, PA

Discussion Leader: Arthur Freedman, Arthur Freedman & Associates, Inc., East Stroudsburg, PA

IWC Representative: Paul Puckorius, Puckorius & Associates, Inc./Water Training Serv., Arvada, CO

PAPER: IWC 09-46

1:30 PM

THE IMPACT OF WATER REUSE ON INDUSTRIAL OPEN EVAPORATIVE COOLING SYSTEMS

Peter Elliott, GE Water & Process Technologies, Trevose, PA

Industrial cooling towers have been seen as ideal repositories for wastewater due to the large volumes of water necessary for evaporative cooling. At a major corn processing plant, a creative combination of mechanical and chemical approaches was employed, making a process wastewater suitable for use as cooling tower makeup water.

Discusser: Dennis McBride, Fluor, Greenville, SC..... 1:55 PM

Closure and Floor Discussion 2:05 PM

PAPER: IWC 09-47

2:20 PM

AN UPDATE OF REUSE WATER EXPERIENCES IN COOLING TOWER WATER SYSTEMS

Paul R. Puckorius, Puckorius & Associates, Inc., Arvada, CO

There have been numerous cooling water systems that have converted from fresh water to recycle (reclaim) water for cooling tower makeup during the past several years. This paper will discuss the problems and the concerns that end users have prior to the conversion as well as their experiences after conversion. Water quality before and after conversion will be provided as well as the variation in water treatment that had to be made with reuse water. Case histories will be provided for refineries, utility power plants and HVAC cooling water systems. These case histories will identify water volume changes, chemical treatment results, and costs associated to the fresh versus reclaim water usage.

Discusser: Jim Dromgoole, Fort Bend Services, Inc.,

Stafford, TX..... 2:45 PM

Closure and Floor Discussion 2:55 PM

Break..... 3:10 PM

PAPER: IWC 09-48

3:30 PM

APPLICATION STUDY ON AN ELECTROLYTIC SOFTENING REACTOR FOR THE REMOVAL OF CALCIUM HARDNESS IN COOLING TOWER WATER SYSTEMS

Jeon Soo Moon, Jae Kuen Lee and Pyl Yang Park, Korea Electric Power Research Institute, Daejeon, Republic of Korea

An electrolytic softening reactor was designed through FLUENT fluid dynamic

TUESDAY SESSIONS

modeling and its scale removal performance was tested with the synthetic water containing calcium hardness in the KEPRI laboratory. The reactor system consists of anode (expanded iridium coating titanium mesh), cathode (cylindrical stainless steel reactor body) and a DC power supply. The alkaline environment of the cathode surface induces the deposition of calcium hardness in the form of CaCO₃.

Discusser: *Arthur Freedman, Arthur Freedman & Associates, Inc., East Stroudsburg, PA*..... 3:55 PM
Closure and Floor Discussion 4:05 PM
Conclusion..... 4:20 PM

Panel Discussion on Recycle Water for Cooling Tower Systems- This panel will answer questions and expand on the requirements for successful replacement of fresh water with recycle water as cooling tower makeup. This is an opportunity to obtain specific details on how to make this change successfully. The panel members represent extensive knowledge and experience of establishing the steps needed in conversion to all types of reuse waters for cooling systems to assure acceptable protection of the cooling water equipment. All questions are welcome

WATER & WASTEWATER MANAGEMENT IN POWER PLANT FGD SYSTEMS – PART II

Date: *Tuesday, October 6*

Time: *1:30-5:00 PM*

Room: *Salon I*

Flue gas desulfurization (FGD) systems are designed to control atmospheric sulfur dioxide emissions by removing SO₂ in a gas-liquid contact absorber using an aqueous slurry made from lime or limestone dissolution. As water-based systems, the trouble-free operation of scrubbers depends upon effective makeup quality selection and reliable chemistry monitoring. In addition, the ability of FGD systems to remove flue gas constituents other than sulfur dioxide (particularly certain trace elements) may also result in scrubber wastewater treatment and discharge implications. This two-part session includes papers that examine all of these water and wastewater management issues in power plant FGD systems.

Session Chair: *Mark Berry, Southern Company Services, Birmingham, AL*

Discussion Leader:

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

PAPER: IWC 09-49

1:30 PM

A ZERO LIQUID DISCHARGE PROCESS FOR BORON RECOVERY FROM FGD WASTEWATER

H. Robert (Bob) Goltz and Chris Eicher, Dow Chemical, Midland, MI; Naomi Levy, Infilco Degremont, Inc., Richmond, VA

Boron can be present in the wastewater of FGD scrubbers and must be removed. Dow Water & Process Solutions and Infilco Degremont, Inc. have developed an end-of-pipe system to remove boron contamination down to required discharge limits. This report will present the results of a successful three month pilot test.

Discusser: 1:55 PM

Closure and Floor Discussion: 2:05 PM

TUESDAY SESSIONS

PAPER: IWC 09-50

2:20 PM

EVALUATING BIOLOGICAL TREATMENT TECHNOLOGIES FOR THE REMOVAL OF MERCURY, SELENIUM, AND OTHER TRACE METALS IN FGD BLOWDOWN WATERS

Eric Blumenstein, Kevin Conroy and Jim Gusek, Golder Associates, Lakewood, CO

A look at the use of biological water treatment technologies to remove mercury, selenium, and other trace metals from FGD blowdown waters. Biological technologies discussed will range from completely passive (biochemical reactors, aerobic wetlands), to semi-passive (anaerobic, aerobic lagoons), to fully active (fixed-biofilm growth, such as packed bed Immobilized Cell Bioreactors).

Discusser: 2:45 PM

Closure and Floor Discussion: 2:55 PM

Break:..... 3:10 PM

PAPER: IWC 09-51

3:30 PM

ZLD ACHIEVED FOR THE TREATMENT OF FGD WASTE WATER AT IATAN STATION

Greg Mandigo, Aquatech ICD, Hartland, WI

A wet FGD scrubber and water treatment system were recently commissioned as part of the Iatan power expansion project. The system has successfully achieved ZLD by meeting the challenges presented by FGD blowdown. This paper describes these water treatment challenges and elaborates on the novel techniques used to achieve ZLD.

Discusser: 3:55 PM

Closure and Floor Discussion: 4:05 PM

PAPER: IWC 09-52

4:20 PM

NEW LOW TEMPERATURE ZLD PROCESS

William Shaw, HPD, a Veolia Water Solutions & Technologies Company, Pewaukee, WI

As regulations and environmental sensitivity increase, many coal-fired power plants are considering ways to reduce their water discharges. Zero liquid discharge (ZLD) processes are being studied in anticipation of even more restrictions on water discharges in the future. Closing the loop by adopting a ZLD treatment scheme will usually involve consideration of evaporation and crystallization technologies as these have had and will continue to play an important role in the recovery and re-use of water from industrial wastewater streams. However, ZLD systems can be very expensive from both a capital and operational perspective and evaporators and crystallizers are often perceived as complicated and difficult to operate. New approaches to evaporator system design, especially low temperature evaporation, will provide additional options to coal-fired power plants which are looking for methods to effectively and economically reduce or eliminate their water discharges from FGD scrubbers and coal or petcoke gasification processes.

Discusser: 4:45 PM

Closure and Floor Discussion: 4:55 PM

TUESDAY SESSIONS

RECOVERY & REUSE OF PRODUCED WATER

Date: Tuesday, October 6
Time: 1:30-5:10 PM
Room: Salon III

Water is very critical component of oil production. Typically 1.5 to 2.5 barrels of water is required per barrel of oil production. Oil industry has been very actively engaged in recovery and recycle of Produced water. This session will cover innovative methods and technologies applied in increasing the recycle/reuse of produced water in oil industry.

Session Chair: Sudhir Parab, ConocoPhillips Canada Limited, Calgary, Alberta

Discussion Leader: John Kus, StatoilHydro Canada Ltd, Calgary, AB

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

PAPER: IWC 09-53

1:30 PM

REUSE OF WATER FOR ONCE THROUGH APPLICATIONS IN OIL SAND

Jasbir Gill, Ph.D., Nalco Company, Naperville, IL

Reuse of water from the onsite ponds poses many challenges due to dissolved inorganic and organic compounds and suspended solids. These challenges are scaling, deposit, corrosion and biofouling. Mitigation of fouling and corrosion requires an holistic approach consisting of both mechanical and chemical solution.

Discusser: Dorothy Neu, Veolia Water/HPD, Milwaukee, WI. 1:55 PM
Closure and Floor Discussion 2:05 PM

PAPER: IWC 09-54

2:20 PM

TREATMENT OF OILFIELD PRODUCED WATERS FOR INDUSTRIAL REUSE

Peter Lemke, Golder Associates Inc., Lakewood, CO; Kevin Conroy, Golder Associates Inc., Denver, CO; Isaac Jurawan, P.E., T.N. Ramnauth & Co. Ltd., Penal, Trinidad, W.I.

Treatment process design is being developed for produced water. Oil/water separation, dissolved air flotation, aerobic biotreatment, and membrane filtration comprise the process. Treated effluent will split between industrial re-use, and nearshore discharge outfall. Supplemental removal of recalcitrant COD after biotreatment is discussed, to meet COD limits for both effluents.

Discusser: Milind Kulkarni, Hatch & Associate, Calgary, AB.. 2:45 PM
Closure and Floor Discussion 2:55 PM
Break..... 3:10 PM

PAPER: IWC 09-55

3:30 PM

OPTIMIZATION OF SAGD PRODUCED WATER EVAPORATOR DESIGN AND IMPACTS ON BLOWDOWN DISPOSAL OPTIONS

Nathan Haralson and William Heins, GE Water & Process Technologies, Bellevue, WA;

Significant development work has been undertaken to optimize the evaporative produced water treatment process, specifically targeting caustic consumption and evaporator blowdown handling. This paper discusses this development work and provides comparisons of capital and operating costs for the recently optimized

WEDNESDAY SESSIONS

evaporative approach as well as several blowdown disposal options.

Discusser: *Mark Nicholson, Veolia Water Solutions and Technologies HPD LLC, Milwaukee, WI*..... 3:55 PM
Closure and Floor Discussion 4:05 PM

PAPER: IWC 09-56

4: 20 PM

PRODUCED WATER RECYCLE REUSE AT THE OMAN MUKHAIZNA OIL FIELD

Dan Bjorklund, Aquatech International Corporation, Hartland, WI

The Mukhaizna oil field in Oman is home of the largest produced water recycle-reuse facility in the world. This facility is also significant as it is the first major application of MVC evaporator technology for Middle Eastern water recycle-reuse. The first phase of the facility recycles produced water using seven identical MVC evaporation trains each with a capacity of recycling 42,860 barrels of high purity water per day for a total capacity of 47,700 M3/day. At Mukhaizna approximately 90% of the produced water will be recycled and will dramatically reduce the amount of aquifer water that would otherwise be required in this desert region with scarce water resources.

Discusser: *Dave Ciszewski, GE Water & Process Technologies, Bellevue, WA*..... 4:45 PM
Closure and Floor Discussion 4:55 PM
Conclusion..... 5:10 PM

COOLING WATER NEW TECHNOLOGIES

Date: **Wednesday, October 7**

Time: **8:00 AM-12: 30 PM**

Room: **Salon I**

Operating cooling systems in a more environmentally friendly and efficient manner is the object of every manager of these systems. This session includes both mechanical and chemical approaches to improving cooling system performance and minimizing waste and inefficiency.

Session Chair: **William Beer, GE Water & Process Technologies, Trevose, PA**

Discussion Leader: **Loraine Huchler, P.E., MarTech Systems, Inc., Lawrenceville, NJ**

IWC Representative: **Paul Puckorius, Puckorius & Associates, Inc./Water Training Service, Arvada, CO**

PAPER: IWC 09-57

8:00 AM

AUTOMATED FEED OF NEW OXIDIZING BIOCIDES PROVIDES "BEST PRACTICE" IN DELIVERY OF CHLORINE DIOXIDE TO SMALL-SCALE SYSTEMS

John W. Byrne and Richard McCaffrey, BASF Catalysts LLC, Iselin, NJ; Keith Hirsch, BASF Corporation, Wyandotte, MI

This presentation will discuss a new feed system that allows for the safe and reliable addition of "made to order" chlorine dioxide solution using dry Aseptrol CW biocide. A full description of the feeder along with its effect on microbiological (MB) growth, especially biofilm, during several trials will be detailed.

Discusser: 8:25 AM
Closure and Floor Discussion 8:35 AM

WEDNESDAY SESSIONS

PAPER: IWC 09-58

8:50 AM

COST-EFFECTIVE NEW LIQUID HALOGEN BIOCIDES WITH BETTER PERFORMANCE AND REDUCED CORROSIVITY

Sang-Hea Shim, Justeq LLC, Northbrook, IL

Halogen biocides, though widely used and largely effective, are corrosive and are unsatisfactory in controlling surface attached microbes, such as slime. A newly patented product, composed of stabilized chlorine and unreacted bromide, controls surface attached microbes, is much less corrosive and is much more cost-effective than other halogen biocides.

Discusser: **9:15 AM**

Closure and Floor Discussion **9:25 AM**

Break..... **9:40 AM**

PAPER: IWC 09-59

10:00 AM

EPA RULE 316B - COMPLIANT PASSIVE INTAKE SYSTEM FOR COOLING WATER

Henry Hunt, Ranney Collector Wells, Columbus, OH

Concerns regarding impacts on aquatic life resulted in specific intake screening design for intakes dedicated for cooling water supplies through EPA Rule 316b. A low-maintenance surface water intake system utilized for almost 50 years that minimizes disturbance during construction will be described including siting, conceptual design elements and operational criteria.

Discusser: Wayne Micheletti, Wayne C. Micheletti, Inc., Charlottesville, VA..... **10:25 AM**

Closure and Floor Discussion **10:35 AM**

PAPER: IWC 09-60

10:50 AM

A COMPARATIVE FIELD EVALUATION OF CHEMICAL AND PULSED POWER WATER TREATMENT

Michael Patton, Clearwater Systems, Essex, CT USA

A study was conducted comparing water treatment performance of traditional chemical water treatment, chemical water treatment with high efficiency filtration and a pulsed power non-chemical water treatment device. The independent study was conducted using three essentially identical cooling tower systems located on a research building at a major university in the Southeastern United States. "City water" was used as makeup to the towers. Parameters evaluated were scaling, total bacteria, and corrosion. The pulsed power water treatment device was found to perform well or better than chemical treatments when judged by the condition of the chiller and tower fill, total bacteria counts, corrosion coupons, and cycles of concentration. Water usage, as measured by cycles of concentration was significantly lower for the pulsed power system than for the other two systems.

Discusser: Kumar Sinah, P.E., Bechtel Power Corporation, Frederick, MD **11:15 AM**

Closure and Floor Discussion **11:25 AM**

WEDNESDAY SESSIONS

PAPER: IWC 09-61

11:40 AM

BEYOND "GREEN TECHNOLOGY": OPTIMIZING ENERGY EFFICIENCY AND ENVIRONMENTAL PERFORMANCE IN COOLING WATER TREATMENT

Mary Wolter Glass, Mexel USA, LLC, Arlington, VA, Dennis Yankee, Tennessee Valley Authority, Knoxville, TN

Energy efficiency and performance of cooling water systems are critical to utilities and industry. Innovations, such as Mexel 432/0, have been tested successfully as replacements for chemicals that present environmental or security risks. With deployment, the environmental trade-offs associated with new technology raise important issues for state and national regulation.

Discusser: 12:05 PM

Closure and Floor Discussion 12:15 PM

Conclusion 12:30 PM

ION EXCHANGE TECHNOLOGY

Date: Wednesday, October 7

Time: 8:00 AM-Noon

Room: Salon II

Ion exchange resins can be used to remove trace constituents from a variety of aqueous sources from waste, to cooling tower, to drinking water. In this session, data are presented on selective removal of ammonia and nitrates from cooling tower water using functionalized adsorbents while another paper discusses commercialization of a silica selective resin able to operate without significantly increasing pH. A third paper describes a novel process, radiation-induced graft polymerization of styrene onto a non-woven fabric, to create a strong acid cation media. Data on capacity, thermal stability and mechanisms of decomposition are discussed. The final paper in this session focuses on the fundamental concepts of various physical, chemical and biological selenium removal technologies. Their relative advantages or disadvantages will be reviewed and performance quantified through case history data.

Session Chair: Donald Downey, Purolite Company, Paris, ON, Canada

Discussion Leader: Peter Midgley, Christ Water Technology Americas, LLC, New Britain, CT

IWC Representative: James Sabzali, Thermax Inc., Novi, MI

PAPER: IWC 09-62

8:00 AM

THE IMPROVEMENT OF THERMAL STABILITY OF STRONG-ACID CATION EXCHANGE FILTER AND THEIR DECOMPOSITION MECHANISM

Shoji Aoki, Junichi Kanno and Hideo Kawazu, Ebara Clean Environment Co., Ltd., Fujisawa-shi, Kanagawa, Japan; Makoto Komatsu, Ebara Corporation, Ohta-ku, Tokyo, Japan

The improvement of thermal stability of strong-acid cation exchange filter, which was prepared by radiation-induced graft polymerization of styrene onto HDPE non-woven fabric and followed by sulfonation, was reported. The decomposition mechanism in hot water was described.

Discusser: 8:25 AM

Closure and Floor Discussion 8:35 AM

WEDNESDAY SESSIONS

PAPER: IWC 09-63

8:50 AM

SELECTIVE SILICA REMOVAL

Peter Meyers, ResinTech, Inc, West Berlin, NJ

Hydroxide form strong base anion resins are well known to be capable of removing silica, along with other anions. Applications for desilicizers have generally been limited due to low capacity and excessively high effluent pH. A series of new hybrid exchangers is able to remove silica preferentially from neutral waters, without increasing pH. The advent of a true "silica selective" media offers significant opportunities to improve the efficiency and reduce operating cost of silica sensitive processes such as boilers, cooling towers and membrane separations.

Discusser: 9:15 AM

Closure and Floor Discussion 9:25 AM

Break..... 9:40 AM

PAPER: IWC 09-64

10:00 AM

SELECTIVE REMOVAL OF AMMONIA AND NITRATE FROM COOLING TOWER IN FERTILIZER AND AMMONIA USING INDUSTRIES BY FUNCTIONAL ADSORBENTS

Shirish Naik, Shardul Kshirsagar, R. Parashtekar, S Krishnan and Kiran Deshpande, Thermax Limited, Pune, India

Recirculating cooling water in fertilizer and ammonia using industries often has ingress of ammonia causing wide pH fluctuations. Nitrifying bacteria further adds to the problem and pH of the circulating water fluctuates in wide range of 3 to 9 causing corrosion and scaling in heat exchangers. This paper discusses a process of maintaining right pH in recirculating cooling water by selectively removing contaminants using a combination of functional adsorbent & ion exchange resins. A side stream from recirculating water is passed through bed of adsorbent and resins in parallel or in series depending on the nature of contaminant to maintain the pH of system within expected range.

Discusser: 10:25 AM

Closure and Floor Discussion 10:35 AM

Conclusion..... 10:50 AM

WEDNESDAY SESSIONS

ON LINE MONITORING (ANALYTICAL)

Date: *Wednesday, October 7*
Time: *8:00-11:40 AM*
Room: *Salon III*

This session will highlight new on-line monitoring techniques for water and wastewater applications inclusive of speciation analysis of selenium in wastewater, boiler scale and corrosion control automation technology, high purity redox potential evaluation for boiler feedwater applications, and the development of a new corrosion product on-line monitoring system using laser induced breakdown technology for usage in nuclear power plant steam generation applications.

Session Chair: *Bob Bryant, Chemtrac, Atlanta, GA*
Discussion Leader: *Ralph Finizio, Pepper Hamilton LLP, Pittsburgh, PA*
IWC Representative: *Wayne Bernahl, W. Bernahl Enterprises Ltd., Elmhurst, IL*

PAPER: IWC 09-65

8:00 AM

APPLICATION OF NEW BOILER SCALE AND CORROSION CONTROL AUTOMATION TECHNOLOGY

Christina Fleming and John Ostberg, Nalco Company, Naperville, IL

Challenging production demands inside the Power House are made even more so today by the volatile economic forces outside it. These economic challenges require all boiler house managers, engineers, and operators to take a fresh look at ways to reduce operating costs, protect asset life, and improve productivity. Recently there have been new developments in automation technology for feedwater treatment monitoring and control to help meet these challenges. This paper discusses Nalco best practice feedwater treatment automation technology using solid-state fluorometer monitoring, and a new measurement for detecting and reacting to corrosion stress conditions at feedwater system temperature and pressures. Four case studies are discussed covering the practical application of this novel automation system from low pressure manufacturing process boilers and university central heating plants, to large high pressure utility applications.

Discusser: *John Vogt, Chemtreat, Inc, Glen Allen, VA* **8:25 AM**
Closure and Floor Discussion **8:35 AM**

REPORT: IWC 09-66

8:50 AM

EVALUATING ON-LINE HIGH PURITY OXYGEN REDUCTION POTENTIAL (ORP) FOR BOILER FEEDWATER QUALITY AS IT RELATES TO AMINE ADDITION AND DISSOLVED OXYGEN LEVELS

Vickie Olson, Honeywell Field Solutions, Atlanta, GA; Jodirah Green, Progress Energy Carolinas Inc., Roxboro, NC

Conditioned boiler feedwater was analyzed with a unique flowing-junction ORP analyzer in comparison with dissolved oxygen and other parameters. Two different fossil plant boiler chemistries were utilized in the evaluation. Correlations were drawn between ORP, DO, hydrazine level to determine the usefulness of this ORP analysis for corrosion control.

Discusser: **9:15 AM**
Closure and Floor Discussion **9:25 AM**
Break..... **9:35 AM**

WEDNESDAY SESSIONS

PAPER: IWC 09-67

10:00 AM

DEVELOPMENT OF AN ON-LINE CORROSION PRODUCT MONITORING SYSTEM USING LIBD TECHNOLOGY

Jeon Soo Moon, Jae Kuen Lee and Pyl Yang Park, Korea Electric Power Research Institute, Daejeon, Republic of Korea

An on-line corrosion product monitoring system was developed for the application in the steam generator systems of nuclear power plants using Laser Induced Breakdown Detection (LIBD) technology. The colloidal corrosion product concentration of several ppb level could be accurately measured within 5 minutes, based on the breakdown probability of induced laser pulse events

Discusser: Claude Gauthier, The Puro-lite Company (Canada), Paris, Ontario, Canada 10:25 AM

Closure and Floor Discussion 10:35 AM

PAPER: IWC 09-68

10:50 AM

ADVANCES IN ANALYTICAL TECHNIQUES FOR SELENIUM SPECIATION ANALYSIS AND THEIR APPLICATION FOR CHARACTERIZATION OF SELENIUM IN WASTEWATER

Hakan Gurleyuk and Ben Wozniak, Applied Speciation and Consulting, LLC, Tukwila, WA

Many power plants are struggling to meet the stringent NPDES permit limits on selenium discharges from their waste streams. While treatment of selenium remains to be a challenging task, different analytical methods can generate inaccurate results for total selenium and selenium speciation compounding the complexity of the problem. Since important treatment decisions are made using accumulated analytical results, the ramifications of generating poor analytical data cannot be understated.

Discusser: 11:15 AM

Closure and Floor Discussion 11:25 AM

Conclusion 11:40 AM

WEDNESDAY SESSIONS

POWER PLANT APPLICATIONS

Date: Wednesday, October 7

Time: 8:00 -9:40 AM

Room: Crystal Room

Various ways to prevent corrosion and damage to plant equipment are presented including how to prepare the plant for an impending hurricane

Session Chair: David Daniels, M&M Engineering, Austin, TX

Discussion Leader: Deborah Bloom, Nalco Company, Naperville, IL

IWC Representative: James Dromgoole, Fort Bend Services, Inc., Stafford, TX

PAPER: IWC 09-69

8:00 AM

THERE IS A HURRICANE COMING - HOW DO I PREPARE MY POWER PLANT?

Christopher Votava, Cottonwood Energy, Deweyville, TX; James C. Dromgoole, Fort Bend Services, Stafford, TX

Each year all Coastal Power Plants face the dilemma of a possible hurricane destroying their facility. Discusses lessons learned by Cottonwood Energy in Deweyville, Texas, and how advanced preparation and planning resulted in the plant surviving with minimum damage despite (Category 3) Hurricane Rita, and (Category 2) Hurricane Ike.

Discusser: 8:25 AM

Closure and Floor Discussion 8:35 AM

PAPER: IWC 09-70

8:50 AM

OPTIMIZING CHEMICAL TREATMENT OF CONDENSATE SYSTEMS IN INDUSTRIAL PLANTS- TOOLS, METHODS, AND STRATEGIES

Robin W. Kluck and James Robinson, GE Water and Process Technologies, Trevose, PA

Effective chemical treatment of steam condensate is critical to industrial plant operation. A good condensate treatment program is based on a thorough system analysis and sound monitoring practices. This paper reviews the variables that influence condensate treatment performance and offers tips for designing and operating a successful program.

Discusser: Irvin J. Cotton, Arthur Freedman Associates,

Newport, RI 9:15 AM

Closure and Floor Discussion 9:25 AM

Conclusion 9:40 AM

WORKSHOPS

CONTINUING EDUCATION WORKSHOPS

This year's workshops will cover relevant topics such as Water and Wastewater Treatment for Produced Water, Ion-Exchange Technology and Practical Operating Practices, Aerobic and Anaerobic Biological Industrial Wastewater Systems Design and Operating Consideration, and others. The workshop program is designed to provide practical information that includes a basic understanding of the topic as well as detailed case studies. They are presented by experts in the field and are loaded with technical content, not sales information. Each workshop will provide an opportunity for a technical exchange between the students, the instructor and other workshop participants. The workshops will provide attendees 4 professional development hours (PDHs) and a certificate of completion. Advance registration and a separate fee of \$250 is required. All workshops are scheduled based on minimum reservations; please inquire at the conference registration desk about the current status of any of the workshops. Discounts are given for multiple registrations.

W1: WATER AND WASTEWATER TREATMENT FOR PRODUCED WATER

WEDNESDAY, OCTOBER 7; 1:00-5:00 PM

Presented by: Guy Mommaerts, Ion Exchange Services (Canada) Inc., Elmira, ON, Canada

This workshop provides an overview of the current produced water treatment systems available that provide a final product quality to match the process requirement. The latter could include off shore disposal, reservoir pressure maintenance, deep well disposal or feed-water for Once Through Steam Generators or Drum Boilers. Four major areas will be covered including de-oiling, lime softening, ion exchange and total dissolved solids reduction (evaporation and membranes). Cost comparisons as appropriate will be presented. Emphasis will be placed on the challenges encountered, overcome and remaining and highlight the ongoing industry developments.

W2: HRSG AND HIGH PRESSURE (> 900 PSIG/ 60 BAR) BOILER WATER TREATMENT AND OPERATION

WEDNESDAY, OCTOBER 7; 1:00-5:00 PM

Presented by: David G. Daniels, Mechanical & Materials Engineering, Austin, TX

This workshop will cover the water quality required for high pressure (> 900 psig) steam boilers, the various treatments being used and new developments relative to protection from scale and corrosion. The course also covers treatment issues related to the pre-boilers and the condensate systems. The course includes a discussion of controls and troubleshooting techniques. Operators, utility plant supervisors, managers, and engineers can all benefit greatly from the practical information provided in this course.

WORKSHOPS

W3: WATER AND WASTEWATER TREATMENT FOR NATURAL GAS FRAC WATER

WEDNESDAY, OCTOBER 7; 1:00-5:00 PM

Presented by: John Schubert, HDR Engineering, Pittsburgh, PA and Joe Tinto, GE Water & Power Technologies

The Marcellus well field is one of several deep shale formations in the US holding substantial reserves of natural gas. It runs from central New York through Pennsylvania and West Virginia, and extends into Kentucky, Virginia and Ohio. Estimated reserves exceed 50 trillion cubic feet of natural gas. To extract the gas requires sophisticated drilling techniques. Hydrofracturing is required to form channels in the shale to allow the gas to flow to the well. This course provides detailed information on water use in the hydrofracturing process, from the water supply side as well as the treatment of flowback water from the frac'd well. The quality requirements for water supply will be reviewed from theoretical and practical perspectives. Data will be presented identifying the nature of water recovery from the hydrofractured well, both for quantity and quality. Treatment options, including thermal treatment options, will be reviewed, and where available design criteria will be noted. Progress will be described on installation/startup of full scale facilities to providing water supply and frac water treatment.

W4: ION-EXCHANGE TECHNOLOGY AND PRACTICAL OPERATING PRACTICES

THURSDAY, OCTOBER 8; 8:00 AM-12:00 NOON

Presented by: 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. A section on how to evaluate systems, their resin, operation, and water quality of ion exchange units is an excellent troubleshooting and informative portion of this workshop. A review of the different ion exchange resins available along with the newest developments and how those can be applied to provide specific water quality is a must for water treatment operations. A great opportunity to ask questions and solve problems.

W5: COMPACT WORKSHOP: COOLING WATER TOPICS

THURSDAY, OCTOBER 8; 8:00 AM-12:00 NOON

(Each compact workshop can be taken for the individual price of \$150 or both for \$250 - To take an individual course, please check at the IWC Registration Desk)

Presented by: Paul Puckorius, Puckorius & Associates, Inc./Water Training Services, Arvada, CO; Arthur Freedman, Arthur Freedman & Associates, Inc.

W5A: MICROBIO CAUSES AND CONTROL

This 2 hour mini work shop will identify the different deposits commonly found in cooling water systems and how they can be controlled. This work shop is packed full of practical useful information that will classify the deposits into scales, foulants, oily materials and gelatinous forms. It will show you how to predict if you will be getting these deposits before they show up in your system. Also what they look like when in your system. Also to be covered will be how these deposits can be minimized or prevented via the old proven methods as well as with the most recent

WORKSHOPS

developments and technologies. A manual will be provided listing these methods, sources of products, and effective techniques for their control. Bring your questions and problems and leave with good answers.

W5B: CORROSION CONTROL IN COOLING WATER SYSTEMS

This two-hour workshop provides practical working knowledge for understanding and controlling corrosion in open and closed cooling water systems. Basic mechanisms are explained, and forms of corrosion are described and illustrated, with discussion of where and why these problems occur. Effects of metallurgy, water composition and operating practices on corrosion are thoroughly discussed, with emphasis on classical methods and new technology for corrosion control in open and closed cooling water systems. Specific questions will be answered throughout the seminar, and time will be available for discussion of problems and case histories. The manual will include copies of all visual material plus additional reference information. Bring your questions about cooling water corrosion and corrosion control, and leave with useful information that you can apply to your systems.

W6: COMPACT WORKSHOP: REVERSE OSMOSIS SYSTEMS

THURSDAY, OCTOBER 8; 8:00 AM-12:00 NOON

(Each compact workshop can be taken for the individual price of \$150 or both for \$250 - To take an individual course, please check at the IWC Registration)

Presented by: Jantje Johnson, Genesys North America, Eden Prairie, MN

W6A: PRETREATMENT OF REVERSE OSMOSIS SYSTEMS

This 2 hour workshop provides information on the pretreatment of reverse osmosis systems. The pretreatment of reverse osmosis systems often include several chemical dosages varying from sodium hypochlorite to antiscalants dependent on the water source. These chemicals can cause deterioration of the RO membranes when incorrectly applied and when unit operations (like multi mediafilters) upstream of the RO system are incorrectly operated/ designed. This workshop provides information on the effect of these chemicals on RO membrane performance. Extra attention will be given to coagulants/flocculants and antiscalants/antifoulants as they cause typically the majority of the RO system problems. Examples of various RO systems will be discussed.

This workshop is designed for RO system operators and designers to gather information, ask questions and solve problems in a workshop environment

W6B: EFFECTIVE CLEANING OF REVERSE OSMOSIS SYSTEMS

This 2 hour workshop provides information on effective cleaning of reverse osmosis systems. Effective cleaning of reverse osmosis systems is dependent on several key parameters. These key parameters include RO system design, membrane selection, cleaning skid design, operation, membrane chemicals and cleaning procedures. Information on these key parameters and their impact on effective cleaning will be discussed in detail. Examples of a various systems will be discussed. This workshop is designed for RO system operators and designers to gather information, ask questions and solve problems in a workshop environment.

WORKSHOPS

W7: AEROBIC AND ANAEROBIC BIOLOGICAL INDUSTRIAL WASTEWATER SYSTEMS DESIGN AND OPERATING CONSIDERATIONS

THURSDAY, OCTOBER 8; 1:00-5:00 PM

Presented by: Dr. Enos L. Stover, PhD, PE, DEE, The Stover Group, Stillwater, OK

This workshop provides a review of the basic design and operating considerations for aerobic and anaerobic treatment technologies that are applied to industrial wastewater treatment for the food, refinery, chemical, power and other industries. The workshop will address basic concepts for organic BOD and COD removal and will introduce concepts for biological nutrient removal. This workshop provides practical design and operational information on the various types (SBR, MBR, MMBR, activated sludge, etc) of biological wastewater treatment technologies in use today for industrial wastewaters.

EXHIBITORS

The IWC Exhibit Hall features over 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 the International Ballroom across from the Conference Registration Desk, on the Hotel's Main Level (see inside front cover for a detailed map).

The Exhibit Hall Hours of Operation are:

- Sunday, October 4: 5:00-7:00pm, with a Get Acquainted Reception
- Monday, October 5: 12noon until 7:00pm, includes Luncheon Buffet & Evening Reception
- Tuesday, October 6: 10:00am until 2:00pm, includes Luncheon Buffet

Be sure to join us for lunch on Monday and Tuesday! Also, during Sunday and Monday evening hours, join us for the Exhibitor-sponsored receptions. Luncheons and Receptions are open to all registered attendees!

An abbreviated listing of all 2009 IWC Exhibitors is provided below, along with their IWC Exhibit Hall Booth #. On the pages that follow you will also find a more detailed listing of these Exhibitors, along with information (along with a brief company description) to contact Exhibitors after the IWC.

Aquatech	48	Industrial Analytics Corp.	50
ASA Analytics	28	Integrated Separation Solutions	25
Association of Water Technologies	6	Johnson March Systems, Inc.	8
Auchtel Products Ltd.	10	LANXESS Sybron Chemicals Inc.	12
Avantech, Inc.	46	Nalco Company	26
BJ Process and Pipeline Services	9	Neptune Chemical Pump Co.	19
Bowen Engineering	29	Niagara Blower Solutions	52
Burkert Fluid Control Systems	39	Pall Corporation	13
BWA Water Additives	23	Pollution Equipment News	27
CHEMICO International, Inc.	7	Powell Water Systems Inc	43
Chemtrac Systems, Inc.	1	ProMinent Fluid Controls, Inc.	54
ChemTreat, Inc.	14	Purolite Company	53
Christ Water Technology Americas	51	ResinTech, Inc.	22
Cooling Technology Institute	47	SAMCO Technologies, Inc.	34
Degremont North America	2	Schreiber LLC	3
DOW Chemical	16	Sentry Equipment Corp.	31
Dripping Wet Water, Inc.	5	Severn Trent Services	30
Ecodyne Limited	4	Siemens Water Technologies	21
Eco-Tec Inc.	18	SWAN Analytical USAInc.	33
Epicor Incorporated	17	Thermax Inc.	35
French Creek Software	37	Thermo Scientific	49
GE Water & Process Technologies	42	Veolia Water Solutions & Tech	36
Genesys North America	45	Water Quality Association	38
Golder Associates, Inc.	11	Waters Equipment Company	19
Graver Water Systems, LLC	4	Welmon, S De R.L. De C.V.	40
Illinois Water Technologies	15	Westech Engineering	24

EXHIBITORS

AQUATECH INTERNATIONAL CORPORATION

Booth: 48
Contact: Amy Bloom
Phone: 724-746-5300
Fax: 724-746-5359
E-mail: blooma@aquatech.com
Website: www.aquatech.com

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

ASA ANALYTICS

Booth: 28
Contact: Jed Reemsnyder
Phone: 262-717-9500
Fax: 262-717-9530
E-mail: jed@chemscan.com
Website: www.activtracanalyzers.com

The new ActivTrac single parameter analyzer from ASA Analytics provides reliable and accurate measurement of Polymer, Molybdate, Ortho Phosphate or Silica in cooling, boiler and wastewater. This device is designed for minimal maintenance with only quarterly reagent refresh, providing isolated level alarm and analog outputs.

AUCHTEL PRODUCTS LTD.

Booth: 10
Contact: Prateek Tandon
Phone: 91-22-4063-2600
E-mail: ptandon@auchtel.com
Website: www.auchtel.com

Auchtel Products Ltd. is a producer of Ion Exchange Resins which find applications in all aspects of the separation technique. Our Auchtelite[®] brand of resins have been creating solutions over three decades in continuous harmony with our customers who are our greatest inspiration. Our resins are used in wide areas of the industry ranging from Water Treatment, Sugar Refining, Power Generation to Catalysis, Enzyme Carrying and Pharmaceutical purification.

AVANTECH, INC.

Booth: 46
Contact: Steve Gagnon
Phone: 803-467-4774
Fax: 803-407-1215
E-mail: sgagnon@avantechinc.com
Website: www.avantechinc.com

AVANTech, Inc. is a comprehensive industrial water treatment solutions provider. Our extensive experience in engineering process systems enables us to create integrated solutions that can dramatically improve operations in industrial, commercial, power, and nuclear power applications.

EXHIBITORS

AWT - ASSOCIATION OF WATER TECHNOLOGIES

Booth: 6
Contact: Heidi Zimmerman
Phone: 240-404-6477
Fax: 301-990-9771
E-mail: awt@awt.org
Website: www.awt.org

AWT is a non-profit trade organization representing over 500 water treatment companies & suppliers throughout the US and internationally. These full-service companies specialize in the application of water treatments for industrial and commercial cooling and heating systems. AWT serves members by providing business and professional education and resource support.

BJ PROCESS AND PIPELINE SERVICES COMPANY

Booth: 9
Contact: Stewart Emmerson
Phone: 832-519-2060
Fax: 832-519-2001
E-mail: Stewart.Emmerson@bjservices.com
Website: www.bjservices.com

Pre-commissioning and turnaround services. Chemical cleaning, boiler and pipe systems. Flowmac flushing of lube and hydraulic systems. Air and nitrogen drying. Accelerated cooldown processes with N₂ and Co₂. Laboratory and development facilities.

BOWEN ENGINEERING

Booth: 29
Contact: David Wrightsman
Phone: 317-842-2616
Fax: 317-841-4257
E-mail: dwrightsm@bowenengineering.com
Website: www.bowenengineering.com

Bowen is a self-performing, employee owned, general contractor focused on water, wastewater and power construction. Headquartered in Indiana, Bowen is working throughout the Central and Eastern United States. As a leading design-builder in the country, our ability to listen and collaborate with our Partners and Clients has made us their contractor of choice. Let's fix it together.

BURKERT FLUID CONTROL SYSTEMS

Booth: 39
Contact: Ursula Johns
Phone: 949-223-3100
Fax: 949-223-3198
E-mail: ursula.johns@burkert.com
Website: www.burkert-usa.com

Burkert Fluid Control Systems is a global system solution provider in the water treatment industry with over 50 years manufacturing experience in flow, temperature, pressure, level, and analytical instrumentation; coupled with over 60 years experience manufacturing solenoid, pneumatic and process valves, Burkert remains the first choice in water treatment solutions.

EXHIBITORS

BWA WATER ADDITIVES

Booth: 23
Contact: Erin Dawson
Phone: 678-802-3050
Fax: 678-802-3024
E-mail: erin.dawson@wateradditives.com
Website: www.wateradditives.com

BWA Water Additives is the leading global provider of specialty water solutions for industrial water treatment, desalination, and oilfield industries. With brands such as; Belclene[®], Belcor[®], Belgard[®], BromiCide[®], Bellasol[®], Belsperse[®], Bellacide[®] and Flocon[®], BWA[™]'s antiscalant, corrosion inhibitor and microbicide technologies are recognized world wide for the highest possible quality and superior technical performance.

CHEMICO INTERNATIONAL, INC.

Booth: 7
Contact: Sam Owens
Phone: 361-883-8255
Fax: 361-883-5446
E-mail: sam@chemico.com
Website: www.chemico.com

CHEMICO specializes in high quality safe treatment products and services for cooling towers, boilers, and closed loop systems. We formulate and manufacture chemical concentrates or bases that are easily blended for end users and distributors. CHEMICO patented HiCycler, a water conservation process for cooling towers.

CHEMTRAC SYSTEMS, INC.

Booth: 1
Contact: Joe Zimmerman
Phone: 770-449-6233
Fax: 770-447-0889
E-mail: chemtrac@chemtrac.com
Website: www.chemtrac.com

Chemtrac Systems, manufactures and sells streaming current monitors, particle counters/monitors, turbidimeters, residual chlorine analyzers, & UV254 monitors for optimizing coagulation/filtration in water treatment.

CHEMTREAT, INC.

Booth: 14
Contact: Sydney Mosley
Phone: 804-935-2182
Fax: 804-965-6974
E-mail: sydneym@chemtreat.com
Website: www.chemtreat.com

ChemTreat, Inc. is the nation's largest and fastest growing specialty chemical company dedicated solely to industrial water treatment. For the best products and world-class service, you've come to the right place. We have over 500 associates working throughout North and South America, the Caribbean, and some areas of Asia/Pacific regions. Our entrepreneurial spirit not only helps drive our company's success, but also carries over into our customers' facilities. We help our customers save millions of dollars every year, enabling us to achieve unparalleled growth in the water treatment industry.

EXHIBITORS

CHRIST WATER TECHNOLOGY AMERICAS

Booth: 51
Contact: Alan Daza
Phone: 860-223-0623
Fax: 860-223-0690
E-mail: adaza@christwater-americas.com
Website: www.christwater-americas.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

Booth: 47
Contact: Frank Foster
Phone: 713-643-0691
Fax: 713-643-0310
E-mail: ffoster@towerperformance.com
Website: 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.

DEGREMONT NORTH AMERICA

Booth: 2
Contact: Anthony Fuhrman
Phone: 412-213-2323
Fax: 412-213-2324
E-mail: anthony.fuhrman@wpt.com
Website: www.degremont-technologies.com

Degremont NA, the world's leader in:

- *Zero Liquid Discharge
- *Boiler Feed Water Treatment
- *Clarification
- *Wastewater Treatment
- *Heavy Metals Removal
- *Biological Treatment

Your single source supplier for custom designed, engineered, manufactured and commissioned industrial water treatment systems. Degremont - The most trusted name in the Water & Wastewater Treatment industry.

EXHIBITORS

DOW CHEMICAL

Booth: 16
Contact: Becky Ersfeld
Phone: 952-914-1002
Fax: 952-835-4996
E-mail: BErsfeld@dow.com
Website: www.dowwatersolutions.com

Dow Water & Process Solutions has a 50 year legacy of providing innovative water and process solutions to both communities and industries alike. A differentiated business unit of The Dow Chemical Company, Dow Water & Process Solutions offers a broad portfolio of ion exchange resins, reverse osmosis membranes, ultrafiltration membranes and electrodeionization products, with strong positions in a number of major application areas, including industrial and municipal water, industrial processes, pharmaceuticals, power, residential water and waste and water reuse. . More information about Dow Water & Process Solutions can be found at www.dowwatersolutions.com.

DRIPPING WET WATER, INC.

Booth: 5
Contact: Allison Sampson
Phone: 830-249-0805
Fax: 830-249-0010
E-mail: sheryl@clo2ix.com
Website: www.clo2ix.com

Biofilms got you down? Are they harboring deadly bacterialike Legionella, costing you efficiency and money in your cooling tower, or fouling membranes in your RO plant? Eliminate and prevent biofilms with our patented, inherently safe, simple and efficient chlorine dioxide systems. Visit us at the show in Booth 5.

ECODYNE LIMITED

Booth: 4
Contact: Paul Kitchen
Phone: 905-332-1404
Fax: 905-332-6726
E-mail: info@ecodyne.com
Website: www.ecodyne.com

Ecodyne Water, an ISO 900 company, is a worldwide leader in custom designed water treatment systems. We bring over 50 years of experience to the design, manufacturer and service of your water treatment equipment including; ultrafiltration, high rate filters, countercurrent packed bed demineralizers, reverse osmosis, mixed bed polishers and deaerators.

EXHIBITORS

ECO-TEC INC.

Booth: 18
Contact: Bonnie Goodspeed
Phone: 905-427-0077
Fax: 905-427-4477
E-mail: bgoodspeed@eco-tec.com
Website: www.eco-tec.com

Eco-Tec is a world leader in the innovative design and manufacture of water purification and chemical recovery solutions. With over 1,500 installations worldwide, Eco-Tec is a leader in advanced ion exchange technology. The patented Recoflo® process reduces installation and operating costs, prolongs resin life and maintains high

EPICOR INCORPORATED

Booth: 17
Contact: Rose Bussicolo
Phone: 908-925-0800
Fax: 908-925-7795
E-mail: epicorinc@aol.com
Website: www.epicorinc.com/

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

FRENCH CREEK SOFTWARE

Booth: 37
Contact: Robert Ferguson
Phone: 610-935-8337
Fax: 610-935-1008
E-mail: robff@frenchcreeksoftware.com
Website: www.frenchcreeksoftware.com

French Creek develops and markets scale and corrosion software tools for water treatment professionals. Standard packages include industry standard WaterCycle® for cooling, hyd-RO-dose™ for membrane systems, WatSim™ for potable, MineSAT™ for mining and waste water, DownHole SAT for oil field. Private label available. Windows DLLs and UNIX libraries available for controllers, web apps, and in-house applications.

GE WATER & PROCESS TECHNOLOGIES

Booth: 42
Contact: James Flakus
Phone: 775-215-2261
Fax: 450-444-0337
E-mail: Jim.Flakus@ge.com
Website: www.ge.com/water

Infrastructure, is a leading global supplier of water treatment, wastewater treatment, zero liquid discharge, 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.

EXHIBITORS

GENESYS NORTH AMERICA

Booth: 45
Contact: Wendy Rae
Phone: 360-435-7070
Fax: 360-435-7373
E-mail: wendy@genesysro.com
Website: www.genesysro.com

Genesys North America specializes in high performance membrane chemicals and services for reverse osmosis and nanofiltration systems. The membrane chemicals include antiscalants and cleaning chemicals. Services encompass cleaning optimization, plant audits and troubleshooting. The expertise of Genesys North America allows customers to reduce the total cost of their RO/NF operation.

GOLDER ASSOCIATES, INC.

Booth: 11
Contact: Kristi White
Phone: 303-980-0540
Fax: 303-985-2080
E-mail: kwhite@golder.com
Website: www.golder.com

Golder Associates is an employee-owned, global group of companies specializing in ground engineering and environmental services. From offices worldwide, our employees work with clients who want to manage their environmental and engineering activities in a technically sound, economically viable and socially responsible manner.

GRAVER WATER SYSTEMS, LLC

Booth: 4
Contact: Robert Applegate
Phone: 908-653-4202
Fax: 908-653-4300
E-mail: rapplegate@graver.com
Website: 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.

ILLINOIS WATER TECHNOLOGIES

Booth: 15
Contact: Melissa Gunsolus
Phone: 815-636-8884
Fax: 815-636-8883
E-mail: melissag@illinoiswatertech.com
Website: 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.

EXHIBITORS

INDUSTRIAL ANALYTICS CORP.

Booth: 50
Contact: Nick Afragola
Phone: 203-245-0380
Fax: 203-245-3698
E-mail: nafragola-IAC@sbcglobal.net
Website: www.swan.ch

Since 1990 IAC has been a national leader in providing on line water quality instruments. Our dedicated professional staff has over 100 years of combined water chemistry experience. IAC knows and meets the needs of the owner plant end user with easy accessibility and the most sophisticated accurate technology available.

INTEGRATED SEPARATION SOLUTIONS, LLC (ISS)

Booth: 25
Contact: John Scott
Phone: 262-736-4211
Fax: 262-736-4214
E-mail: jscott@isepsol.com
Website: www.isepsol.com

ISS's Water Group has extensive experience in engineering and manufacture of water purification equipment for the power industry: multimedia filters, softeners, reverse osmosis units, mixed-beds, condensate polishers with flows to 10,000 GPM.

JOHNSON MARCH SYSTEMS, INC.

Booth: 8
Contact: John Sands
Phone: 215-364-2500
Fax: 215-764-5425
E-mail: john.sands@johnsonmarch.com
Website: 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.

Booth: 12
Contact: Dwight Tamaki
Phone: 609-893-1100
Fax: 609-894-8641
E-mail: dwight.tamaki@lanxess.com
Website: www.ionexchange.com

Sybron Chemicals Inc., a Lanxess Company, provides world-class ion exchange resins to meet your needs. From cocurrent softening to condensate polishing. Lewatit MonoPlus uniform-particle size resins, and specialty resins, have proven their values across the water treatment market. Lanxess is also unique in its water treatment chemicals, including the Preventol® and Baypure® product lines, as well as Bayhibit® and Hydrazine Hydrate.

EXHIBITORS

NALCO COMPANY

Booth: 26
Contact: Cathy Stetenfeld
Phone: 630-305-1239
Fax: 630-305-2947
E-mail: cstetenfeld@nalco.com
Website: www.nalco.com

Nalco provides essential expertise for water, energy and air. We help our customers reduce energy, water and other natural resource consumption, enhance air quality, minimize environmental releases and improve productivity and end products while boosting their bottom line. Together our comprehensive solutions contribute to the sustainable development of customer operations. Nalco is a member of the Dow Jones Sustainability World Index. More than 11,500 Nalco employees operate in 130 countries supported by a comprehensive network of manufacturing facilities, sales offices and research centers to serve a broad range of end markets.

NEPTUNE CHEMICAL PUMP CO.

Booth: 19
Contact: Thomas R. O'Donnell
Phone: 215-699-8700
Fax: 215-699-0370
E-mail: tomo@neptune1.com
Website: www.neptune1.com

Neptune Chemical Pump Co. is a manufacturer of metering pumps, portable mixers, chemical feed systems, liquid polymer blending systems and glycol feed systems plus water treatment accessories including bypass feeders, bromine feeders, sample coolers, injection quills and corporation stops. In addition, Neptune manufactures relief valves, back pressure valves and calibration columns.

NIAGARA BLOWER HEAT TRANSFER SOLUTIONS

Booth: 52
Contact: Peter Demakos
Phone: 716-875-2000
Fax: 716-875-1077
E-mail: pgdemakos@niagarablower.com
Website: www.niagarablower.com

Niagara Blower is a design-build manufacturer providing engineered solutions to heat transfer applications at power, process, refinery, food and brewing facilities worldwide since 1904. Niagara's customized product lines include WSAC closed-loop, evaporative coolers and condensers and No-Frost[®] liquid desiccant dehumidification systems.

EXHIBITORS

PALL CORPORATION

Booth: 13
Contact: Donna DeMarah
Phone: 516-484-3600
Fax: 516-484-0364
E-mail: donna_demarah@pall.com
Website: www.pall.com

Pall Power Generation is a 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.

Booth: 27
Contact: Karen Galante
Phone: 412-364-5366
Fax: 412-369-9720
E-mail: karen@rimbach.com
Website: www.rimbach.com

POLLUTION EQUIPMENT NEWS reaches over 90,000 professionals covering the entire pollution abatement market. Products and literature for air, water, wastewater and hazardous waste pollution are featured.

POWELL WATER SYSTEMS INC

Booth: 43
Contact: Scott Powell
Phone: 303-627-0320
Fax: 303-627-0116
E-mail: scottpowell@powellwater.com
Website: www.powellwater.com

Powell Water is the industry leader and the world's largest supplier of industrial electrocoagulation (EC) systems with over 150 installations worldwide. EC has become recognized as a very effective means for economically treating a wide variety of challenging water problems. Stop by our booth to see an operating demonstration unit.

PROMINENT FLUID CONTROLS, INC.

Booth: 54
Contact: Scott Staniszewski
Phone: 412-788-7919
Fax: 412-787-0704
E-mail: sales@prominent.us
Website: www.prominent.us

ProMinent Fluid Controls, Inc. is a global manufacturer of chemical metering pumps, water quality instrumentation, specialized disinfection equipment, and pre-engineered or custom skidded systems serving the Water and Wastewater industries. We have proudly served the Municipal, Industrial and OEM markets in the United States for over 30 years.

EXHIBITORS

PUROLITE COMPANY

Booth: 53
Contact: Don Downey
Phone: 800 343 1500
Fax: 610-668-8139
E-mail: info@puroliteUSA.com
Website: www.PUROLITE.com

Purolite's focus is the development, manufacture, marketing and support of resins for Ion-Exchange, Adsorbents, Catalysts, and Special Applications. With our market-leading team of field experts, global manufacturing capability and record of innovative research, Purolite® offers the most extensive range of products of any resin manufacturer.

RESINTECH, INC.

Booth: 22
Contact: David Malkmus
Phone: 856-768-9600
Fax: 856-768-9601
E-mail: ixresin@resintech.com
Website: www.resintech.com

ResinTech Inc., an acknowledged leader in ion exchange, manufactures a broad range of ion exchange resins for water and wastewater treatment, including deionization, softening, metals removal, product purification, resource recovery, and pollution control. In addition to its ion exchange resins, ResinTech supplies activated carbon and inorganic media. ResinTech has an experienced staff that can assist in determining optimum resin use as well as resin performance.

SAMCO TECHNOLOGIES, INC.

Booth: 34
Contact: Robert Bellitto
Phone: 716-743-9000
Fax: 716-743-1220
E-mail: bellitor@samcotech.com
Website: www.samcotech.com

Skid mounted integrated turn-key solutions for pure/waste water and process filtration-separation. Innovative minimum waste/high yield water management and recovery 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.

EXHIBITORS

SCHREIBER LLC

Booth: 3
Contact: William Kunzman
Phone: 205-655-7466
Fax: 205-655-7669
E-mail: billk@schreiberwater.com
Website: 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.

Booth: 31
Contact: Myron Feldman
Phone: 262-567-7256
Fax: 262-567-4523
E-mail: myronf@sentry-equip.com
Website: www.sentry-equip.com

Sentry Equipment Corp manufactures sample conditioning components and analysis systems for water and steam, supplying plant chemists and engineers with tools for accurate water chemistry control. Sample coolers, spiral tube and dual tube heat exchangers, pressure reducing valves, corrosion products samplers, and other water sampling equipment are Sentry's specialty.

SEVERN TRENT SERVICES

Booth: 30
Contact: Chuck Guzelli
Phone: 412-494-4084
Fax: 412-788-8304
E-mail: cguzeli@severntrentservices.com
Website: www.severntrentservices.com

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

EXHIBITORS

SIEMENS WATER TECHNOLOGIES

Booth: 21
Contact: Karen McNaboe
Phone: 800-525-0658
Fax: 847-706-6933
E-mail: information.water@siemens.com
Website: www.water.siemens.com/en/Pages/default.aspx

Industries around the globe rely on Siemens Water Technologies' systems and water professionals to deliver the right solution to their most critical water challenges. Through innovative technology and related services, Siemens helps meet industry specific water quality requirements, while also improving efficiency and reducing and reducing waste.

SWAN ANALYTICAL USA INC.

Booth: 33
Contact: Chris Dreher
Phone: 847-835-1863
Fax:
E-mail: chrisdreherglencoe@yahoo.com
Website: www.swan.ch

Swan Analytical Instruments, incorporated in 1991, is a Swiss company that develops and globally markets applicable instrumentation for on-line water analysis in potable water and wastewater treatment plants as well in power plants and other industries. The company has two divisions: Instrumentation and Systems. Swan's goal is to exceed the expectation of every customer by offering solutions to complex measurement issues, as well as outstanding customer service and greater value than the competition. By doing so, our customers' systems are optimized and efficiency is improved. The company's employees (100) are distinguished by their technical expertise combined with their hands-on experience. Swan recently established a wholly owned subsidiary in the USA. Swan Analytical USA, located in the Chicago area, will be serving existing and new customers as of January 2, 2010.

THERMAX INC.

Booth: 35
Contact: Jim Sabzali
Phone: 248-474-3050
Fax: 248-474-5790
E-mail: jsabzali@thermax-usa.com
Website: 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.

EXHIBITORS

THERMO SCIENTIFIC

Booth: 49
Contact: Sokhom Bin
Phone: 978-232-6000
Fax: 978-232-1042
E-mail: info.water@thermo.com
Website: www.thermo.com/processwater

Thermo Scientific offers a broad range of analytical measurement options to meet critical local and national requirements for water and wastewater testing with accuracy and confidence you can trust. Thermo Scientific Orion and AquaSensors products are designed for flexibility, ease-of-use and low cost operation at each sample point.

VEOLIA WATER SOLUTIONS & TECHNOLOGIES

Booth: 36
Contact: Carla Robinson
Phone: 412-809-6712
Fax: 412-809-6711
E-mail: Carla.Robinson@veoliawater.com
Website: www.veoliawaterstna.com

Veolia Water Solutions & Technologies offers unique technologies, process design, construction and installation of systems for:

- Source Water Treatment
- Water Recycle/Reuse
- Zero Liquid Discharge

Centers of Expertise:

- HPD – Evaporation/Crystallization Processes
- Whittier Filtration – Advanced Filtration Systems
- N.A. Water Systems – Solutions for the Entire Water Cycle

WATER QUALITY ASSOCIATION

Booth: 38
Contact: Tanya Lubner, PhD
Phone: 630 505 0160
Fax: 630-505-9637
E-mail: tlubner@wqa.org
Website: 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.

EXHIBITORS

WATERS EQUIPMENT COMPANY

Booth: 19
Contact: Brian Reichley
Phone: 215-699-8700, x330
Fax: 215-699-8795
E-mail: brianr@watersequipment.com
Website: www.watersequipment.com

Waters Equipment has been building custom steam/water sampling and analysis systems for over 45 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 sampling conditioning modules, cooling water isolation skids and hotwell samplers.

WELMON, S DE R.L. DE C.V.

Booth: 40
Contact: Hugo Maldonado Ibarra
Phone: 52-81-8046-4610
Fax: 52-81-8046-4606
E-mail: hugo-maldonado@welmon.com.mx
Website: www.welmon.com.mx/main-en.html

Welmon is a company created to satisfy the needs of pressure vessels, heat exchangers and API storage tanks, for the Oil & Gas, chemical, petrochemical, mining, power generation, pharmaceutical, food processing, paper and water treatment industries, among others.

WESTECH ENGINEERING

Booth: 24
Contact: Jim Woods
Phone: 801-265-1000
Fax: 801-265-1380
E-mail: jwoods@westech-inc.com
Website: www.westech-inc.com

For raw water pretreatment, cooling water, water reuse, wastewater and potable water treatment, Westech is your independent source for reliable industrial and municipal process treatment equipment designed, engineered, built for long lasting efficiency. For new plants, design build, and retrofits, Westech offers the process, manufacturing and project management experience required.



www.internationalwaterconference.org

Mark Your Calendar!
The 71st Annual
International Water Conference[®]
October 23-28, 2010
The Crowne Plaza Riverwalk Hotel
San Antonio, TX, USA



Sponsored by:

The Engineers' Society of Western Pennsylvania

The Pittsburgh Engineers' Building
337 Fourth Avenue
Pittsburgh, PA 15222

Tele: 412-261-0710

Fax: 412-261-1606

E-mail: eswp@eswp.com

Web site: www.eswp.com/water

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, times and program content are subject to change.