

A Message from the Conference Chair

The Executive Committee, the Advisory Council, and the Engineers' Society of Western Pennsylvania welcome you to Pittsburgh for the Annual International Water Conference.



This year marks the 60th Anniversary of the International Water Conference (IWC), and we are pleased to present what will be a very informative and exciting experience.

The IWC has a rich history of technical excellence, and this year promises to continue that tradition. Attendees will have their choice of four simultaneous sessions over the course of the Conference. This year, 20 sessions will offer numerous topics including seawater desalination, water reuse, business management trends, and Legionella occurrence control. Traditional topics also are amply covered. We invite you to look closely at the details of our program since there is something of interest to everyone involved in industrial water treatment today. The International Water Conference covers every important aspect of the water industry today, and the business of managing water.

In addition to the strong technical sessions, the IWC also offers informative and interesting luncheons covering relevant topics of concern in today's industrial water business.

If networking is of particular interest to you, the IWC affords numerous opportunities to interact with colleagues by visiting the Info Share suites throughout the hotel, and receptions and luncheons throughout the Conference. Leaders in the water treatment communities — both technical and marketing — will be available at the company sponsored Info Share suites. These are a popular component of each year's conference.

We are also very proud to have Rebecca Mark as the keynote Speaker for our opening plenary session. As chairman and CEO of Azurix and vice chairman of Enron, Ms. Mark can provide important insight into the future of water treatment from one of the world's leading integrated energy companies.

As the world's premier water Conference, the 60th annual International Water Conference offers an unparalleled opportunity to learn, exchange information, and network, and we are confident that you will take away a truly rich and rewarding experience.

Schedule at a Glance

Monday, October 18, 1999
7:30am

GRAND BALLROOM
(17th Floor)

Continental Breakfast
Sponsored by
AMBI Design, Inc.

URBAN ROOM
(17th Floor)

WILLIAM PENN ROOM
(Lower Lobby)

MONONGAHELA ROOM
(17th Floor)

KEYNOTE ADDRESS: 8:30 - 9:30am FEATURING REBECCA MARK GRAND BALLROOM

Morning Session: 10:00am-12:00pm

Business & Management
Trends

Heat Exchanger
Design Considerations &
Performance Monitoring

Economics of Water
Treatment Systems

Controlling Macrofouling
in Industrial Wastewater
Systems

LUNCHEON: 12:00 - 1:30pm "A GREEN ALTERNATIVE TO CHLORINE OXIDATION PROCESSES PANELED / OVAL

ROOM

Afternoon Session: 2:00pm-5:00pm

Legionella: Update on
Occurrences & Control

Pretreatment for Ion
Exchange /
Membrane Processes

HRSGs Don't have
to be a Problem

Seawater Desalination
for Industrial Uses

Schedule at a Glance		GRAND BALLROOM (17th Floor)	URBAN ROOM (17th Floor)	WILLIAM PENN ROOM (Lower Lobby)	MONONGAHELA ROOM (17th Floor)
Tuesday, October 19, 1999					
Morning Session: 8:00am - 12:00pm		EDI Membrane Processes	International Experiences in Wastewater Reuse	Traditional Cooling Water Concepts	Primary Metals Industry: Water Problems & Solutions
LUNCHEON: 12:00 - 1:30pm "STATUS REPORT ON REVISED IRON AND STEEL EFFLUENT GUIDELINES" PANELED/OVAL ROOM					
Afternoon Session: 2:00pm - 5:00pm		Solving Membrane Operational Problems	Industrial Wastewater Reuse	New Concepts in Cooling Water Treatment	Power Systems Water Technology
Wednesday, October 20, 1999					
Morning Session: 8:00am - 12:00pm		Advances in Ion Exchange Technology	Power Plant Monitoring	Innovative Membrane Processes	Microbiological Control



IWC

EXECUTIVE COMMITTEE

The ESWP and all involved with the IWC wish to acknowledge and thank the following companies whose employees participate on the IWC Executive Committee:

• Alcoa	Edward Maziarz
• Aristech Chemical Corporation	Kathleen Lagnese
• Calgon Corporation	Alan Smith
• CH2M HILL	David McFayden
• Malcolm Clemens	
• Cyrus Rice Water Consultants	David Simon
• Duquesne Light	Joseph Venzon
• Global Water Technologies	Paul O'Boyle
• Kroff Chemical Company	Fred Potthoff
• Modular Environmental Technologies, Inc.	John Schubert
• Westinghouse Electric Company	Andrew Calderwood

IWC ADVISORY COUNCIL

The International Water Conference is supported by the 45 companies of the IWC Advisory Council. Recognized as leaders in the water treatment field, the Advisory Council members provide unique insight into the industry and advise the IWC Executive Committee on matters that will improve the Conference.

Advisory Council Company	Contact Name
• Albright & Wilson Americas	Brian Failon
• AMBI-Design, Inc.	Shan Sundaram
• Aquatech International Corporation	V.N. Sharma
• Ashland Chemical Company/ Drew Industrial Division	Doug Dewitt-Dick
• Baker Petrolite	Mike Dalton
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• Bechtel	Kumar Sinha
• Betz Dearborn	James O. Robinson
• Black & Veatch	Charles H. Fritz
• Buckman Laboratories, Inc.	Robert Roup
• Calgon Corporation	Dileep Thatte
• Capital Controls Company	James Martin
• Chemisis, Inc.	Robert J. Cunningham
• Chem Treat	Dennis Martin
• Cochrane Environmental Systems	William J. Runyan
• Croll-Reynolds Engineering Co.	J.J. Quinlan
• Dow Chemical Company	Daniel Rice
• Dupont-Permassep Products	Richard O. Myers, Jr.
• Ecolchem, Inc.	William S. Miller
• Epicor Incorporated	Richard Hetherington
• Fort Bend Services, Inc.	James C. Dromgoole
• Glegg Water Conditioning Inc.	Jerry Alexander

IWC

ADVISORY COUNCIL

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- Hydrochem Industrial Services Inc. John Sullivan
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- MPW Industrial Services Dale Champion
- Nalco Chemical Company Wayne Bernahl
- Puckorius & Associates, Inc. Paul Puckorius
- The Purolite Company Cindy Gresham
- ResinTech Michael C. Gottlieb
- Rohm and Haas Company Edward D. Nace
- Sargent & Lundy Engineers Alroy F. Aschoff
- Sentry Equipment Corporation Myron Feldman
- Sheppard T. Powell Associates David Cline, Jr.
- Sybron Chemicals, Inc. Tom X. Dupnik
- USFilter Mary Ellen Tucker
- Zinkan Enterprises, Inc. Louis J. Koenig

PITTSBURGH ATTRACTIONS

Pittsburgh is a dynamic city with a strong industrial heritage. It features beautiful parks, rivers, and more golf courses per capita than any city in the United States. Visitors can enjoy an interactive science center, world-class museums and riverboat cruises along the city's three rivers.

Pittsburgh's compact Golden Triangle puts you within easy walking distance of five major hotels, the David L. Lawrence Convention Center, more than a dozen historical and cultural attractions, architectural landmarks, professional sports, great shopping and restaurants to delight every taste.

When it comes to dining, the choices range from casual family-style restaurants to a forgotten train station that has been transformed into a stunning restaurant, shopping and entertainment complex. A quick incline ride to scenic Mt. Washington not only provides you with a wide range of choices for both casual and elegant dining but delivers a spectacular view of the city. There's also our river-front boardwalk featuring nautical-theme restaurants and nite-life.

For detailed information on restaurants, museums, shopping and other things to do and see in Pittsburgh, please visit our **Information Table** on the 17th Floor near the Registration Desk.

RUN AROUND THE RIVERS

We're going to do it again! Run, or if you wish, walk around beautiful downtown Pittsburgh and some of its three rivers at dawn. This will be our sixth year.

- Time: Tuesday morning, October 19 at 7:00a.m.
- Place: Westin William Penn Hotel, William Penn Place Entrance (across from the park)
- Distance: Approximately 3.0 miles — Whether you're walking or running, it's sure to be a fun-filled workout.
- Sponsored by: ResinTech, Incorporated

REGISTRATION DESK

The Registration Desk is located in the 17th Floor Coat Room.

Hours of Operation are:

- | | |
|-----------|---------------------|
| Sunday | 6:30 pm to 8:30 pm |
| Monday | 7:30 am to 5:00 pm |
| Tuesday | 7:30 am to 5:00 pm |
| Wednesday | 7:30 am to 12:00 pm |

NAME BADGE IDENTIFICATION

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

MESSAGE BOARD

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

REGISTRATION LISTS

Registrations received prior to **October 8, 1999** have been compiled in THE IWC REGISTRATION LIST. This popular service sponsored by Nalco Chemical Co. provides attendees with additional networking opportunities.

An Addendum will be available the morning of Wednesday, October 20. It will contain those attendees that registered after October 8 and on-site during the Conference.

An Electronic version of the full Registration List will be available at the Registration Desk the morning of Wednesday, October 20. It provides the names of all registered attendees in both Excel 5.0 and comma-delimited text formats. There is a \$25 administrative charge.

PRE-PRINT ROOM

Pre-prints for all technical presentations are available at the Pre-Print Room located in the 17th Floor Foyer. Pre-prints can be purchased for just \$2.00 per copy. Also, you can find copies of previous years' IWC Proceedings (for \$55 per volume). The Pre-Print Room will be open Sunday evening 6:00 pm to 8:30 pm, Monday and Tuesday – from 8:00 am to 5:00 pm, and Wednesday 8:00 am to 1:00 pm.

AMERICANS WITH DISABILITIES ACT

The International Water Conference and 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 IWC staff at the Registration Desk and advise us of any such requirements.

General

CONFERENCE INFORMATION

HOTEL INFORMATION

Westin William Penn Hotel	(412) 281-7100
DoubleTree Hotel	(412) 281-3700
Marriott City Center	(412) 471-4000
Ramada Plaza Suites	(412) 281-5800

SHUTTLE SERVICE

Shuttle buses will operate at regular intervals between the Westin William Penn and the Doubletree, Marriott and Ramada. Buses will depart from the main entrance of each hotel.

Hours of Operation:

Sunday, October 17, 1999	6:00 p.m. - 10:00 p.m.
Monday, October 18, 1999	7:00 a.m. - midnight
Tuesday, October 19, 1999	7:00 a.m. - midnight
Wednesday, October 20, 1999	7:00 a.m. - 2:00 p.m.



KEY

- P** Parking
- T** Light Rail Station
- 1** Westin William Penn
- 2** Ramada
- 3** Doubletree
- 4** Marriott
- 5** ESWP

ANNUAL 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 **Richard W. Lutey**.

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 paper in the field of power systems water technology that was presented at the 59th Annual Water Conference – Paper #IWC-98-03 “Avoiding Potential Problems in Diagnosing Boiler Tube Failure Mechanisms” by **Mel J. Esmacher, P.E.**, BetzDearborn.

JOSEPH A. LEVENDUSKY MEMORIAL SCHOLARSHIP

The sixteenth Joseph A. Levendusky Memorial Scholarship will be presented at the Opening Ceremonies of the International Water Conference. The recipient of the 1999 Scholarship is **Ryan Olszowy**.

As a memorial to Joseph Levendusky, its founder and president, Epicor, Incorporated established this Scholarship fund in cooperation with the International Water Conference Executive Board. This scholarship is committed to helping educate and develop individuals interested in furthering the technical society to which Mr. Levendusky was dedicated.

Monday

TECHNICAL SESSIONS

7:30am Registration desk opens, 17th floor
7:30am Continental Breakfast

OPENING CEREMONIES

8:30-9:30AM GRAND BALLROOM, 17TH FLOOR

David McFayden, *General Chairman, International Water Conference*

Presentation of Joseph A. Levendusky Scholarship

Presentation of Paul Cohen Award

Presentation of Annual Merit Award

Keynote Speaker Address

Rebecca Mark, *Vice Chairman, Enron Corporation, Chairman & CEO, Azurix*

9:40am Coffee Break

BUSINESS AND MANAGEMENT TRENDS

10AM-12PM GRAND BALLROOM, 17TH FLOOR

Session Chair: Robert Cunningham, *Chemisis, Inc., Trinity Center, CA*

Discussion Leader: Albert Owens, *Cyrus Rice Water Consultants, Pittsburgh, PA*

IWC Representative: Paul O'Boyle, *Global Water Technologies, Pittsburgh, PA*

IWC-99-01 Report

10:00am **The Business Aspect of an Effective Safety Program/How Safety Can Have a Positive Affect on Both Contractors and Facility Management**
Fred Kile, *US Filter, Rockford, IL*

Traditionally, there have been two reasons for promoting safety: the human aspect and the legal aspect. The driving forces that will take safety to new levels in coming years are: the cost/profitability aspect and the need for excellent safety performance as a condition of doing business for contractors and plant owners.

10:20am Floor Discussion

IWC-99-02 Paper

10:30am **The Water Audit as a Strategic Tool to Manage Operational Costs and Performance**
Harry DeLonge, *US Filter, Amenia NY*; Karen Asher, *US Filter, Lowell, MA*

Food and beverage plants focus on two objectives: producing high quality product in a well-run production facility, and maintaining effective cost control and investment planning. We address the audit as a tool to improve operating performance and manage financial costs.

10:55am Prepared Discussion: Carson Barry, *Westvaco Corporation, Luke, MD*

Monday

TECHNICAL SESSIONS

- 11:05am Closure & Floor Discussion
- 11:20am **IWC-99-03 Paper**
Managing Outsourcing to Profitability
Daniel Shannon, *Baker Hughes Industrial Services, Houston, TX*; Robert M. Howe, *Aware Operating Services, Inc.*
- Successful outsourcing of industrial utility infrastructure requires that the relationship be profitable to client and outsourcing partner alike. The paper defines required ingredients in an outsourcing project that result in the relationship producing profit. A completed outsourcing project will be presented documenting reductions in operating costs and profit generation.
- 11:45am Prepared Discussion: Dennis Shea, *Solutia, Inc., Alvin, TX*
- 11:55am Closure & Floor Discussion

CONTROLLING MACROFOULING IN INDUSTRIAL WASTE SYSTEMS

10AM-12PM **MONONGAHELA ROOM, 17TH FLOOR**

Session Chair: Patrick Gill, *Calgon Corporation, Pittsburgh, PA*

IWC Representative: Alan Smith, *Calgon Corporation, Pittsburgh, PA*

IWC-99-04 Paper

- 10:00am **Impacts and Control of the Zebra Mussel**
Charles R. O'Neill, Jr., *New York Sea Grant, Brockport, NY*

Because of an affinity for water currents, zebra mussels extensively foul electric power generation, industrial, municipal and private drinking water intakes, and navigation, irrigation, and water distribution canals, causing significant physical damage and increased operating expenses. While, there is no single "silver bullet" for controlling the mussels in all settings, there are a number of control technologies that can be utilized to minimize those impacts, each suitable for use under differing conditions in various infrastructure settings.

- 10:20am Floor Discussion

IWC-99-05 Paper

- 10:30am **Use of Low Level Electric Currents to Prevent The Settlement of Zebra Mussels on Intake Structures**
Clois D. Fears, *Delta Applied Technology, Inc., Pittsburgh, PA*

Laboratory and field tests have confirmed the efficacy of low level electric fields in preventing the attachment of zebra mussels to protected surfaces. The system technology is outlined with a description of three commercial installations where variations of this system are installed. Current investigations and potential uses are described.

Monday

TECHNICAL SESSIONS

10:50am Floor Discussion

IWC-99-06 Paper

11:00am **Nine Mile Point Unit Two and Zebra Mussels — A Retrospective**

R.F. Green, *Niagara Mohawk Power Corporation, Lycoming, NY*

Nine Mile Point Unit Two (NMP2) is a 1210 MWE boiling water reactor operated by Niagara Mohawk Power Corporation (NMPC). Located in Lycoming, New York, the plant uses the waters of Lake Ontario for their daily service water needs and as the ultimate heat sink in the event of a design basis accident. The service water system supplies in excess of 100 heat exchangers of various types via piping ranging from under 2in. NPS to 36in. NPS.

This paper will discuss the evolution of the Nine Mile Point program through the years in an effort to prevent mussel infestation and comply with Federal and State environmental requirements.

11:20am Floor Discussion

ECONOMICS OF WATER TREATMENT SYSTEMS

10AM-12PM WILLIAM PENN BALLROOM, WILLIAM PENN LEVEL

Session Chair: Shan Sundaram, *AMBI-Design, Inc., Rockford, IL*

Discussion Leader: Terry LaTerra, *Graver Water Systems, Cranford, NJ*

IWC Representative: Joseph Venzon, *Duquesne Light Company, Pittsburgh, PA*

IWC-99-09 Paper

10:00am **The Importance of Net Present Value (NPV) Analysis to Choose Between Purchase and Lease Options of Water Treatment Systems**

Shan Sundaram, *AMBI-Design, Inc., Rockford, IL*

The net present value (NPV) financial analysis of a water treatment system/project is the most dependable analytical tool in choosing between the purchase and lease options.

The input of difference parameters such as interest rates, tax benefits, cost and benefit items will be elaborated and shown that the values assumed for these critical factors greatly change the results of analysis. The focus will be on arriving at realistic input values of important factors to accomplish useful NPV analysis in making purchase vs. lease options.

10:25am Prepared Discussion: Terry LaTerra, *Graver Water Systems, Cranford, NJ*

10:35am Closure & Floor Discussion

- 10:50am **IWC-99-07 Paper**
Total Installed Cost Savings of Skid Mounted Versus Field Erected Equipment: A Case Study
Kenneth G. Excell, P.E., *Water & Power Technologies, Inc., Salt Lake City, UT*; Carl T. Lincoln, P.E., *Technid-USA, Houston, TX*
- In this paper, the estimated total installed cost of a block mounted water treatment system is compared to the actual total installed cost of a skid mounted water treatment system. The integrated approach of the skid mounted system resulted in a 20% reduction of actual costs versus estimated costs of the water treatment system.
- 11:15am Prepared Discussion: Bob Bradley, *Hydrometrics, Montgomery, TX*
- 11:25am Closure & Floor Discussion
- 11:40am **IWC-99-08 Paper**
Economics of Resin Replacement
Amy Lettovsky, *Rohm and Haas Company, Philadelphia, PA*
- In this highly competitive environment all costs are scrutinized — including the cost to run a demineralizer. This paper presents a method to calculate the payback for replacing resin by considering both resin and operational costs. This allows for smarter decision-making and better planning, budgeting and management of resin rebeds.
- 12:05pm Prepared Discussion: Michael O'Brien, *Graver Water Systems, Cranford, NJ*
- 12:15pm Closure & Floor Discussion

HEAT EXCHANGER DESIGN CONSIDERATIONS & PERFORMANCE MONITORING

10AM-12PM URBAN ROOM, 17TH FLOOR

Session Chair: Doug DeWitt-Dick, *Ashland Chemical Company, Drew Industrial Division, Portland, TX*

Discussion Leader: Bennett Boffardi, *Boffardi & Associates, Bethel Park, PA*

IWC Representative: Andrew Calderwood, *Westinghouse Nuclear Services Division, Madison, PA*

- 10:00am **IWC-99-10 Paper**
Condenser Chemistry and Performance Monitoring: A Critical Necessity for Reliable Steam Plant Operation
Brad Buecker, *Consultant, Lawrence, KS*

The steam surface condenser is a critical heat exchanger at many power production plants. It can also be the major source of contaminant introduction to the steam generating system. Scale buildups in condenser tubes or air in-leakage may cause serious efficiency losses. This paper outlines causes of condenser upsets and monitoring methods to detect such problems.

Monday

TECHNICAL SESSIONS

10:25am Prepared Discussion: Eric Hale, *Nalco Chemical Co., Naperville, IL*

10:35am Closure & Floor Discussion

IWC-99-11 Paper

10:50am **Heat Exchanger Design & Operation to Minimize Efficiency Loss**

George Hays, *Ashland Chemical Company, Boonton, NJ*; James Knudsen, *Oregon State University, Corvallis, OR*

This paper uses design and operating conditions to empirically predict the type and extent of fouling which would occur in various heat exchangers operating on a single cooling water system. The predictions are validated by on-line monitoring. Adoption of certain design and operation criteria is recommended to minimize fouling and total cost of ownership.

11:15am Prepared Discussion: Raymond Post, *Betz Dearborn, Trevoise, PA*

11:25am Closure & Floor Discussion

IWC-99-81 Report

11:40am **Optimal Design of Tube Bundle Size to Accommodate Effects of Dynamic Fouling on Steam Generator Thermal Efficiency**

Chris Hu, *Westinghouse Electric Company, Madison, PA*

Tube deposit results in steam pressure loss or gain depending on fouling dynamics. Deposit removal may not recover the loss. Its causes are discussed in terms of deposit conditions and their effect on boiling. Accordingly, an optimal size of tube bundle can be designed for maintaining thermal efficiency.

12:00pm **PANEL DISCUSSION**

LUNCHEON: A "GREEN ALTERNATIVE" TO CHLORINE OXIDATION PROCESSES

12-2PM

PANELED/OVAL ROOM, MEZZANINE

Special Guest Speaker: Terry Collins Ph.D.,
Professor, Research Team Leader at Carnegie Mellon University, Pittsburgh, PA

Dr. Collins has identified a way to activate hydrogen peroxide, making it a potent oxidizing agent for a wide variety of industrial bleaching and disinfecting applications. Catalyst activate hydrogen peroxide eliminates dioxins and other toxic pollutants now released into the world's waterways.

HRSGS DON'T HAVE TO BE A PROBLEM

Organized by the ASME Research & Technology Committee on Water and Steam in Thermal Power Systems

2-5PM

WILLIAM PENN BALLROOM, WILLIAM PENN LEVEL

Session Chair: James Robinson, *BetzDearborn, Horsham, PA*

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

2:00pm

IWC-99-12 Report

Changing Boiler Water Treatment Needs in High Pressure HRSG's

R. Henry Weed, P.E., *BetzDearborn, Horsham, PA*

This paper compares the traditional boiler water treatment needs of an HRSG operating above 1000 psi, to the treatment needs of the new boiler system designs. It looks at the individual changes in equipment or design, then discusses the treatment implications associated with each of the features. Finally, the effect of plant operations on treatment selection are examined.

2:20pm

IWC-99-13 Report

Combined Cycle and Cogeneration System Water Chemistry and Operations; A Consultant's View

K. Anthony Selby, *Water Technology Consultants, LLC, Evergreen, CO*

Combined cycle and cogeneration plants, using HRSGs, require detailed attention to water chemistry issues. The consultant is required to take a "big picture" view in order to balance the needs of the boiler, the needs of the turbine and the needs of the process (in the case of cogeneration systems). The needs of these separate parts of the system must be met and the water treatment programs must be cost effective.

Monday

TECHNICAL SESSIONS

- 2:40pm **IWC-99-14 Report**
Performance Monitoring in the Water Treatment of HRSG's
Anton Banweg, Nalco Chemical Company, Naperville, IL
There are a wide variety of HRSG designs in operation today. In addition they can vary in service from that of a pure utility generator to one that may be integrated into an industrial manufacturing process. The proper selection and application of water chemistry monitoring and performance monitoring is required to properly treat these systems.
- 3:00pm **IWC-99-15 Report**
UltraPure Steam From Normal Feedwater
Dr. James Bellows, Siemens Westinghouse, Orlando, FL
Interim purity requirements for steam cooled combustion turbine components have lower concentrations for some species than steam turbine recommendations. The rationale for such low concentrations will be briefly presented.
- 3:45pm **PANEL DISCUSSION**
Coffee break will be set in the back of session room

LEGIONELLA: UPDATE ON OCCURRENCES AND CONTROL

2-5PM GRAND BALLROOM, 17TH FLOOR

Session Chair: *Dileep Thatte, Calgon Corporation, Pittsburgh, PA*

IWC Representative: *Alan Smith, Calgon Corporation, Pittsburgh, PA*

- 2:00pm **IWC-99-17 Report**
Cooling Tower Systems & Legionella Bacteria: Recent USA Incidences/Outbreaks/Causes/Corrective Actions Methods — Are We Making Progress? What Action Should Be Taken?
Paul Puckorius, Puckorius & Associates, Inc., Evergreen, CO

A summary of Legionnaires disease throughout the USA is provided. Also, a review of the cooling systems involved relative to causes, water treatment and system design plus system operating practices, are summarized and discussed in detail relative to their contribution to the growth of Legionella bacteria.

- 2:20pm Floor Discussion

- 2:30pm **IWC-99-18 Report**
The Elimination of Legionella in Local Hot and Cold Water Systems Using a Novel Chlorine Dioxide Technique
Dr. Arthur Harris, *Feedwater Ltd, Moreton, Wirral, UK*;
Dr. Mike Rendell, *BTG International Ltd, London, UK*
- A report is given of the elimination of Legionella pneumophila and other bacteria from contaminated hot and cold water services by the use of a novel, safe and readily controllable chlorine dioxide system. Full biological and chemical details demonstrate the effectiveness of the system and other potential applications are discussed.
- 2:50pm Floor Discussion
- 3:30-3:45pm Coffee Break**
- 3:50pm **IWC-99-19 Report**
Efficacy of Biocides Against Biofilm-Associated Legionella in a Model Plumbing System
Edward McCall, John Kuchta, Janet Stout, Victor Yu, Bethany Rihs, Bill Young, and Radisav Vidic, *Infectious Diseases/VA Medical Center, Pittsburgh, PA*
- The efficacy of biocides against biofilm-associated Legionella and heterotrophic bacteria was tested in a model plumbing system at 0, 0.5, 1, 3, 12, and 48 hours after biocide addition. The rank-order of effectiveness from highest to lowest of the biocides tested is chlorine > chloro-bromo-dimethylhydantoin > glutaraldehyde > carbamate poly-quaternary ammonium. Some biocides have marginal activity against Legionella.
- 4:10pm Floor Discussion
- 4:20pm **PANEL DISCUSSION**

Monday

TECHNICAL SESSIONS

PRETREATMENT FOR ION EXCHANGE/ MEMBRANE PROCESSES

2-5PM

URBAN ROOM, 17TH FLOOR

Session Chair: Robert Taylor, *Ecolochem, Inc., Norfolk, VA*

Discussion Leader: Greg Bartley, *Tennessee Valley Authority, Chattanooga, TN*

IWC Representative: Edward Maziarz, *Alcoa, Pittsburgh, PA*

IWC-99-20 Paper

2:00pm

Ceramic Membrane Microfiltration in the Treatment of Domestic Sewage — Pretreatment to Reverse Osmosis

David Threlfall, *Ecolochem International, Inc., Peterborough, UK*

Ceramic membrane microfiltration can deliver low SKI water from domestic sewage in a single stage. Removal of suspended solids, nutrients and biological species from the sewage must be achieved for the permeate to be suitable for RO feed. The results of trials on different sewage streams are presented.

2:25pm

Prepared Discussion: Ricky Bryant, *Southern Company Services, Birmingham, AL*

2:35pm

Closure & Floor Discussion

IWC-99-21 Paper

2:50pm

Pretreatment Applications Using a New UltraFiloc® Membrane

Wil Pergande, *Osmonics Inc., Rockland, MA*

A relatively new membrane has now been developed and packaged into a new spiral element configuration. Pilot testing and data obtained on surface water and oilfield produced water applications will be discussed and presented. Performance data will be presented to indicate that it has the capabilities of providing an alternative to hollow fiber membranes for specific municipal water treatment applications and pre-treatment for deionization and brackish and seawater RO plants.

3:15pm

Prepared Discussion: Scott Beardsley, *Dow Filmtec, Edina, MN*

3:25pm

Closure & Floor Discussion

3:40-4:00pm Coffee Break

IWC-99-22 Paper

4:00pm

Capillary UF as RO Pretreatment

Wayne Bates, *Hydranautics, Rockton, IL*

This paper will focus on the capital and operating cost comparisons of a capillary ultrafiltration (UF) system relative to conventional non-membrane pretreatment systems. Significant advances have occurred, both technically and commercially, in capillary-base UF technology that warrants a fresh look at UF as pretreatment to RO on difficult feed water sources.

Monday

TECHNICAL SESSIONS

- 4:25pm Prepared Discussion: Phil Rolchigo, *Osmonics, Inc., Minnetonka, MN*
- 4:35pm Closure & Floor Discussion
- IWC-99-23 Paper**
- 4:50pm **Biological Control in Demineralizer Pretreatment Systems**
Robert Bartholomew, P.E., *Sheppard T. Powell Associates, LLC, Baltimore, MD*
- Biological fouling of membrane-based demineralizers or pretreatment system components can result in reduced performance and/or damage to system materials. Biological control methods can damage demineralization system components — if not properly applied. This paper introduces the many alternatives for biological control and protection of ion exchange resins and membranes.
- 5:15pm Prepared Discussion: John Currier, *Tennessee Valley Authority, Chattanooga, TN*
- 5:25pm Closure & Floor Discussion

SEAWATER DESALINATION FOR INDUSTRIAL USES

2-5PM

MONONGAHELA ROOM, 17TH FLOOR

Session Chair: Richard Myers, *DuPont Permasep, Newark, DE*

Discussion Leader: Dave Morris, *Chester Engineers, Pittsburgh, PA*

IWC Representative: Fred Potthoff, *Kroff Chemical Company, Pittsburgh, PA*

IWC-99-24 Report

- 2:00pm **Reducing RO Operating Costs with Automated Monitoring Technology**
Stan Lueck, *RODI Systems Corp, Aztec, NM*

Reverse osmosis is in wide use for sea water desalination. Operating these systems, however, can be expensive due to the amount of time required for proper monitoring. The use of modern, automated monitoring hardware can greatly reduce the cost of system operation by lowering these man power requirements.

- 2:20pm Floor Discussion

Monday

TECHNICAL SESSIONS

2:30pm **IWC-99-25 Paper**
Mechanical Vapor Compression (MVC) Seawater Desalination for Industrial Applications, Case Studies
Sharif Disi, *Mechanical Equipment Company, Inc., New Orleans, LA*

This paper presents 2 case studies of Mechanical Vapor Compression Seawater Desalination for industrial use. Each case study covers basic plant design parameters, materials of construction, performance, desalinated water quality, utilities' consumption, pre-treatment, scale inhibition, post-treatment, and operation and maintenance issues. Also covered are plant overall size and space requirements, intake, and field installation and startup requirements.

2:55pm Prepared Discussion: Richard Ahlgren, *Ahlgren Associates, Milwaukee, WI*

3:05pm Closure & Floor Discussion

3:20-3:40pm Coffee Break

3:50pm **IWC-99-26 Paper**
SWRO for Aquaculture
Donald Terrill, *George Scott International, Pensacola, FL*

The breeding and hatching of shrimp require careful control of the aquatic environment. A constant, reliable source of water for dilution is essential since the hatchlings will not survive a major variation in salinity. Reverse osmosis was chosen to assure control of the quality and quantity of water.

4:15pm Prepared Discussion

4:25pm Closure & Floor Discussion

4:40pm **PANEL DISCUSSION:**
Seawater Desalting for Industrial Use:
Who Wants It? Who Needs It?

GOOD FELLOWSHIP MIXER

6:30PM

GRAND BALLROOM, 17TH FLOOR

Sponsored by the Advisory Council Companies
Entertainment Sponsored by Calgon Corporation

Tuesday

TECHNICAL SESSIONS

7:30am Registration desk opens, 17th floor

EDI MEMBRANE PROCESSES

8AM-12PM GRAND BALLROOM, 17TH FLOOR

Session Chair: Edward Geishecker, *Ionics, Incorporated, Watertown, MA*

Discussion Leader: Craig Lockhart, *Graver Water, Cranford, NJ*

IWC Representative: Edward Maziarz, *Alcoa, Pittsburgh, PA*

IWC-99-27 Paper

8:00am **Latest Developments in Continuous Electrodeionization (CED) Technology**
Anil D. Jha and Gary C. Ganzi, *US Filter, Lowell, MA*

In the last 10 years, Continuous Electrodeionization (CED) technology has evolved to a technology applied in power, microelectronics and other fluid processing applications. The authors will discuss various configurations including theory of operation and expected performance in variety of feed water conditions. Based on the performance characteristics, customers in power, microelectronics and other applications will be able to select the most suitable CED configuration for their needs.

8:25am Prepared Discussion: Dick Sampson, *Halox Technologies Corporation, Bridgeport, CT*

8:35am Closure & Floor Discussion

IWC-99-28 Paper

8:50am **Improvement in UPW System by Utilizing EDI**
Lyndon Fleming, Ted Prato, and Li Zhang, *Ionics, Inc., Watertown, MA*

This paper presents operating data for a 360 gpm ultrapure water system which utilized electrodeionization (EDI) technology. EDI in this application has been successfully proven to reduce operating costs in areas such as ion-exchange regeneration, consumable chemicals and manpower. Cost reductions with EDI were achieved while increasing overall system performance and reliability.

9:15am Prepared Discussion: Ronald Picht, *Environmental Dynamics Corporation, Sharon, WI*

9:25am Closure & Floor Discussion

9:40-10am **Coffee Break — Sponsored by Calgon Corporation**

Tuesday

TECHNICAL SESSIONS

- 10:00am **IWC-99-29 Report**
Speciation of Weakly-Ionized Impurities in Electrodeionization
David Tessier, *E-Cell Corporation, Guelph, Ontario, Canada*
- This report details our mechanistic EDI investigations on the removal of weakly ionized impurities in the presence of background ionic load. Detailed results are presented on the removal of carbon dioxide as a function of CO₂ concentration, applied current and concentration of salt. The implications for the design of water purification systems based on RO/EDI are discussed in terms of the nature of the feed water and the product water specifications.
- 10:20am Floor Discussion
- 10:30am **IWC-99-30 Report**
Gas Transfer Membranes — The New Norm in the Water Treatment Market
Allen Pittman, *CELGARD, Charlotte, NC*
- Gas Transfer Membranes are the latest technology to be embraced by the water treatment industry, complementing the modularity of Reverse Osmosis, Continuous Deionization, and Filtration. This report will review the evolution of gas transfer membranes and where they are used today, with some prediction of the future.
- 10:50am Floor Discussion

PRIMARY METALS INDUSTRY: WATER PROBLEMS & SOLUTIONS

8AM-12PM **MONONGAHELA ROOM, 17TH FLOOR**

Session Chair: Tom Bodner, *AK Steel Corporation, Middletown, OH*

IWC Representative: John Schubert, *Modular Environmental Technologies, Inc., Pittsburgh, PA*

- 8:00am **IWC-99-31 Paper**
Removal of Selenium from a Storm Water Runoff Pond
Stephen Ellis, *Ecolochem, Inc., Norfolk, VA*
- A large southwest utility found it necessary to reduce the volume of a runoff pond containing selenium at concentrations above their discharge limits. Preliminary studies indicated that all of the selenium was present as selenate, and could be rejected using filtration and reverse osmosis. This treatment has consistently produced an effluent well below the discharge limitations for over five months.
- 8:25am Prepared Discussion: Kashi Banerjee, *USFilter/Chester Engineers, Moon Township, PA*
- 8:35am Closure & Floor Discussion

Tuesday

TECHNICAL SESSIONS

- 8:50am **IWC-99-32 Paper**
Advances in Water and Wastewater Treatment for Foundries
Ross Fuller and Christopher Leitz, *Ashland Chemical Company, Boonton, NJ*
- Foundries have cooling water, boiler water and wastewater treatment requirements that are similar to those in other industries. They also have requirements that are uniquely theirs, technically, operationally and environmentally. This paper describes, in detail, the problems encountered in foundry water systems, their causes, and modern, advanced technologies to alleviate the problems, taking into consideration today's environmental concerns.
- 9:15am Prepared Discussion: Denny Doran, *Nalco Chemical Co., Pittsburgh, PA*
- 9:25am Closure & Floor Discussion
- 9:40-10am **Coffee Break — Sponsored by Calgon Corporation**
- 10:00am **IWC-99-33 Paper**
Zero Discharge Process to Regenerate Hydrochloric Acid Pickling Liquor
Douglas Olsen, *Green Technology Group, Pawling, NY*; Charles Blumenschein, P.E., DEE, *Chester Engineers, Pittsburgh, PA*
- A new zero discharge process has been developed to regenerate the hydrochloric acid in spent pickle liquor (SPL). The process uses sulfuric acid to produce ferrous sulfate heptahydrate from the ferrous chloride in the SPL, leaving a solution with a restored concentration of hydrochloric acid suitable for recycling in the pickle tub. The ferrous sulfate crystals are a product in demand, resulting in zero waste generation.
- 10:25am Prepared Discussion: Michael Sieckmann, *ISSI/Amrox, Pittsburgh, PA*
- 10:35am Closure & Floor Discussion
- 10:50am **PANEL DISCUSSION — Cyanide Removal in the Steel Industry**
Dr. Rajat Ghosh, *ThermoRetec Corporation*; Bob Helwig, *US Filter/Chester Engineers*; John Schubert, *Modular Environmental Technologies, Inc.*

INTERNATIONAL EXPERIENCES IN WASTEWATER REUSE

8AM-12PM URBAN ROOM, 17TH FLOOR

Session Chair: Kumar Sinha, *Bechtel Power Corporation, Gaithersburg, MD*

Discussion Leader: Albert Owens, *Cyrus Rice Water Consultants, Pittsburgh, PA*

IWC Representative: David McFayden, *CH2M HILL, Pittsburgh, PA*

IWC-99-34 Report

8:00am **Recovery of Well Water Reverse Osmosis Reject at GM de Mexico Ramos Arizpe Complex**

Lawrence Krzeswski, *General Motors, Detroit, MI*; G. Garza, *Consultant*, and D. Valle, *GM de Mexico*

This report provides an update of the performance of a softening/microfiltration/reverse osmosis system designed to maximize the utilization of well water at the GM de Mexico Ramos Arizpe Complex. The system was installed as a second stage for the existing well water RO units.

8:20am Floor Discussion

IWC-99-35 Paper

8:30am **Water Conservation Techniques, Recovery/ Recycling for Zero Discharge at KRIBHCO**

D. K. Pande, *Krishak Bharati Co-Operative Ltd, Surat, India*

Water is most precious gift of nature. Water technology & pollution control play significant role for our developing infrastructures. Limitations of water resources dictate that water conservation through water management is a necessity. Various water conservation techniques were adopted which resulted in savings of 2.5 MGD water equivalent to US \$2.4 millions per annum.

8:55am Prepared Discussion: S. S. Mitra, *ENRON, Maharastra, India*

9:05am Closure & Floor Discussion

9:20-9:45am **Coffee Break — Sponsored by Calgon Corporation**

IWC-99-36 Paper

9:45am **A Unique High Recovery RO System Design Leads to Wastewater Reuse at a Large Pharmaceutical Manufacturing Plant**

Michael Humphreys, Margaret Wolfe, *Membrane Systems Corporation, San Diego, CA*; Kenneth Tracy, *Warner Lambert Co.*, George Patrick, *Parsons Engineering Science, Inc., Atlanta, GA*

This paper details the concept of using automatic permeate recycle in a very high recovery reverse osmosis system as a method for wastewater concentration and control of product quality, and discusses the

Tuesday

TECHNICAL SESSIONS

challenges of using RO to treat wastewater with high concentrations of calcium, silica and organic compounds.

10:10am Prepared Discussion: Dennis McBride, *Intel Corp., Rio Rancho, NM*

10:20am Closure & Floor Discussion

IWC-99-37 Paper

10:35am **Water Reuse in an Integrated Circuit Packaging Plant**
Timothy Keister, CWT, *ProChemTech International, Inc., Brockway, PA*

Process operations in integrated circuit packaging plants use high purity water and produce a wastewater containing suspended solids, surfactants, and heavy metals. Design, installation, and operation of an integrated system to produce high quality water, treat the wastewater, and recycle the treated wastewater back into the high quality water production train has been achieved with 95% water recovery.

11:00am Prepared Discussion: Susan Coulter, *US Filter, Rockford, IL*

11:10am Closure & Floor Discussion

TRADITIONAL COOLING WATER CONCEPTS

8AM-12PM

WILLIAM PENN BALLROOM, WILLIAM PENN LEVEL

Session Chair: Robert Cunningham, *Chemisis, Inc., Trinity Center, CA*

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

IWC Representative: Fred Potthoff, *Kroff Chemical Company, Pittsburgh, PA*

8:00am **IWC-99-38 Paper**
An Evaluation of Multiple Water Treatment Programs for the Plant Farley Service Water System

William E. Garrett, Jr., *Alabama Power Company, Birmingham, AL*

The Electric Power Research Institute, Alabama Power Company and Farley Nuclear Plant performed a side stream study to evaluate multiple water treatment programs against an optimized sodium hypochlorite one-through service water treatment program. The purpose of this paper is to present some of the microfouling, corrosion and deposition results.

8:25am Prepared Discussion: to be announced

8:35am Closure & Floor Discussion

Tuesday

TECHNICAL SESSIONS

- 8:50am **IWC-99-39 Paper**
Development of a Mechanistic Understanding of Aromatic Triazole Consumption in Cooling Water
Jennifer Horne, John E. Hoots, Frank Lu and Narasimha Rao, *Nalco Chemical Company, Naperville, IL*
Aromatic triazoles are used widely for yellow metal corrosion inhibition in cooling water systems. This paper examines factors affecting triazole performance in a cooling water environment: adsorption on yellow metal surfaces, "halogen consumption", precipitation and biodegradation. With a clear understanding of these factors, a rational approach to product selection can be developed.
- 9:15am Prepared Discussion: to be announced
9:25am Closure & Floor Discussion
- 9:45-10am **Coffee Break — Sponsored by Calgon Corporation**
- 10:00am **IWC-99-40 Paper**
Halogen Tolerant High LSI Calcium Carbonate and Corrosion Inhibition in Cooling Waters
Jasbir Gill, Ph.D. and James Zakrzewski, *Calgon Corporation, Pittsburgh, PA*
The cooling water treatment described in this paper is based on a synergistic mixture of 2 chlorine/bromine tolerant scale and corrosion inhibitors. The treatment is cost-effective compared to all organic treatment and also environmentally friendly as it uses both a very low level of phosphate and no heavy metals for corrosion control.
- 10:25am Prepared Discussion: Arthur Freedman, *Arthur Freedman Associates, Inc., East Stroudsburg, PA*
10:35am Closure & Floor Discussion
- 10:50am **IWC-99-41 Paper**
The Chemicals for Cooling Water in China
Qinai Bao, *Shanghai Petrochemical Co., Ltd., Jin Shan Wei, Shanghai, China*
This paper reviews the Chinese history of development of chemicals including phosphonates, water soluble polymers, oxidizing and non-oxidizing biocides for open recirculating cooling water systems. A survey of commercialization and market outline of these chemicals is given. Also, recent trends are summarized.
- 11:15am Prepared Discussion: Mike Dalton, *Baker Petrolite, Sugarland, TX*
11:25am Closure & Floor Discussion

LUNCHEON: STATUS REPORT ON REVISED IRON AND STEEL EFFLUENT GUIDELINES

12-2PM

PANELED / OVAL ROOM, MEZZANINE

Special Guest Speaker: George Jett, *U.S. EPA*

In the presentation at this luncheon, George Jett from U.S. EPA will discuss the progress and status of the work his group is doing to update the categorical discharge limits for the iron and steel industry. This effort is progressing rapidly toward completion, and will, when completed, define what the iron and steel industry will be permitted to discharge. Following the presentation, Mr. Jett will answer questions from the audience as time permits.

INDUSTRIAL WASTEWATER REUSE

2-5PM

URBAN ROOM, 17TH FLOOR

Session Chair: Albert Owens, *Cyrus Rice Water Consultants, Pittsburgh, PA*

Discussion Leader: Kumar Sinha, *Bechtel Power Corporation, Gaithersburg, MD*

IWC Representative: David McFayden, *CH2M HILL, Pittsburgh, PA*

IWC-99-42 Report

2:00pm

Cooling Towers & and Secondary Waste Water Makeup: Four Years' Operating Experience

Robert DeBenedetto, *Public Service Elec. & Gas Co., Ridgefield, NJ*; Arthur Freedman, *Arthur Freedman Associates, Inc., East Stroudsburg, PA*; George Hays and Drew Boschetti, *Ashland Chemical Co., Drew Division, Boonton, NJ*

This report describes four years operating experience in a 650 MW combined cycle power station incorporating film fill cooling towers using secondary sewage effluent makeup. Biofouling is controlled with chlorine dioxide. A water treatment task force was formed and procedures were developed to resolve emerging chemical and mechanical issues.

2:20pm

Floor Discussion

Tuesday

TECHNICAL SESSIONS

- 2:30pm **IWC-99-43 Report**
Follow-up Report to Logan Generating Plant Experience with Zero Liquid Discharge
Christopher Headley, *US Generating Company, Swedesboro, NJ*
- This report will present a follow-up to the paper entitled "Logan Generating Plant Experience With Zero-Liquid Discharge" which was presented at the 1996 International Water Conference. Three years of recent plant improvements and optimization, along with a discussion of future capital improvements will be covered in this follow-up report.
- 2:50pm Floor Discussion
- 3:00pm **IWC-99-44 Paper**
Innovative Methods for Recycling Wastewater in Power Plants to Reduce Impact on Zero Discharge Systems
Susan Baines and Kumar Sinha, *Bechtel Power Corporation, Gaithersburg, MD*
- In regions where discharge of power plant wastewater has stringent requirements, wastewater treatment and reuse methods must be utilized to continue with the plant permitting process. This paper discusses some innovative methods that can be implemented in power plants for recycling wastewater and reducing the cost of zero discharge systems.
- 3:25pm Prepared Discussion: Mike Dalton, *Baker Petrolite, Sugarland, TX*
- 3:35pm Closure & Floor Discussion
- 3:50-4:10pm **Coffee Break — Sponsored by Epicor Incorporated, Hungerford & Terry Inc. and Thermax Limited**
- 4:10pm **IWC-99-80 Report**
New Zero Liquid Discharge Strategy — Boiler Feed Makeup From Cooling Tower Blowdown Using Reverse Osmosis and Ion Exchange
Allen Boyce, *SEH America*; Devesh Sharma, *Aquatech International*
- A new technology is now available to convert a large liability, the cooling tower blowdown (CTBD), into an asset, the boiler feed makeup (BFMU), and at the same time, provide significant benefit in achieving zero liquid discharge for the facility as a whole. The new process utilizes reverse osmosis along with ion exchange, to produce BFMU, and utilizes CTBD as feed to the process. The process can accept CTBD at or near saturation with regards to silica, calcium carbonate, magnesium silicate, barium and strontium sulfates as well as other sparingly soluble constituents.
- 4:35pm Prepared Discussion: Wayne Micheletti, *Wayne C. Micheletti, Inc., Charlottesville, VA*
- 4:45pm Floor Discussion

NEW CONCEPTS IN COOLING WATER TREATMENT

2-5PM

WILLIAM PENN BALLROOM, WILLIAM PENN LEVEL

Session Chair: Martin Orban, *Mitco Inc., Grand Rapids, MI*

Discussion Leader: Dr. Michael Trulear, *ChemTreat, Inc., Glen Allen, VA*

IWC Representative: Fred Potthoff, *Kroff Chemical Company, Pittsburgh, PA*

IWC-99-46 Report

2:00pm

The Effect of Sand Grain Uniformity on the Filtration Efficiencies

Zhongfang Lei, *Dept. of Environmental Science and Engineering, Fudan University, Shanghai, China*; Qinai Bao, *Shanghai Petrochemical Co. Ltd., Shanghai, China*

Mono-medium valveless sand filters are commonly used but always in low efficiencies in the side-stream treatment of most cooling water systems. Our recent investigations with a pilot filter model revealed that desirable filtration efficiencies could be achieved through more uniform sand grain layers.

2:20pm

Floor Discussion

IWC-99-47 Paper

2:30pm

Cooling Water Scale & Scaling Indices: What They Mean — How to Use Them Effectively — How They Can Cut Treatment Costs!

Paul Puckorius, *Puckorius & Associates, Inc., Evergreen, CO*

The various scales commonly encountered in cooling water are identified and classified as to those most frequently found and the reasons for their occurrence. Various predictive scaling indices are identified and reviewed. Specific water quality examples illustrate the variation and accuracy of these indices. Case histories are provided for illustration.

2:55pm

Prepared Discussion: Wayne Micheletti, *Wayne C. Micheletti Inc., Charlottesville, VA*

3:05pm

Closure & Floor Discussion

Tuesday

TECHNICAL SESSIONS

- 3:20pm **IWC-99-48 Report**
High Cycle Cooling Tower Operation: Hurdles and Solutions
Don Johnson, D. A. Meier, J. E. Hoots, B. Yang and J. D. Lammering, *Nalco Chemical Company, Naperville, IL*
The operation of recirculating cooling systems at high concentration factors provides many economic and environmental benefits. At the same time, there are technical issues that must be managed in order to prevent increases in waterside problems resulting in reduced plant efficiency, reliability and longevity. This paper explores the technical issues which can limit concentration factors and presents solutions which can extend or eliminate these limits.
- 3:40pm Floor Discussion
- 3:50-4:10pm **Coffee Break — Sponsored by Epicor Incorporated, Hungerford & Terry Inc., and Thermax Limited**
- 4:10pm **IWC-99-49 Paper**
Development of an "All Organic" Chemical Treatment, Specifically for Cooling Water with High Phosphate and Calcium Content
Sergio Castro, *Instituto Mexicano Del Petroleo (IMP), Mexico, D.F., Mexico*
This work reviews and evaluates the development of an "all organic" package, specific for high phosphate content. This "all organic" package allows working in more benign pH ranges, allowing for greater security and protection, in view of the corrosion rate being lowered to values below 1.0 mpa. Furthermore, by virtue of the nature of its components, it is a more environmentally friendly treatment.
- 4:35pm Prepared Discussion: Brian Failon, *Albright & Wilson Americas, Inc., Glen Allen, VA*
- 4:45pm Closure & Floor Discussion
- 5:00pm **IWC-99-50 Paper**
Maintaining Effective Cooling Tower Performance when Using Contaminated Makeup Water
Ricardo De Araujo Fernandes, *BetzDearborn Brazil LTDA, Cotia, S. Paulo, Brazil*; Altino Alves Bento, *Petrouqimica Uniao, Maua, SP, Brazil*
A large Brazilian ethylene plant uses contaminated water as cooling tower make-up. The plant operating rate was reduced due to corrosion problems and poor heat transfer from microbiological fouling. To restore production, an on-line cleaning program was implemented and a new treatment program was applied to achieve optimum system performance.
- 5:25pm Prepared Discussion: Dr. John Richardson, *ChemTreat, Inc., Ashland, VA*
- 5:35pm Closure & Floor Discussion

POWER SYSTEMS WATER TECHNOLOGY

2-5PM

MONONGAHELA ROOM, 17TH FLOOR

Session Chair: James Bellows, *Siemens Westinghouse, Orlando, FL*

Discussion Leader: Steve Shulder, *Baltimore Gas & Electric, Baltimore, MD*

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

IWC-99-52 Report

2:00pm

High Pressure Boiler Metals Transport

Thomas Pike, *Western Farmers Electric Cooperative, Inc., Ft. Towson, OK*; Emery Lange, Jr., *Ashland Chemical Company, Memphis, TN*

Central to the performance of any boiler is the internal cleanliness of its tubes. Although industry continues to improve boiler feedwater-sampling systems, some older systems may be producing erroneous data as to the quality of metal oxide being transported to the boiler. When results from these analyses are used to estimate the actual metals transport, significant error can result. This report investigates one such problem and the steps taken to circumvent the problem.

2:20pm

Floor Discussion

IWC-99-51 Paper

2:30pm

Corrosion-Product Transport Analysis by Non-Destructive X-Ray and Gamma-Ray Methods

Dr. Jerzy Sawicki and Barbara Sawicka, *AECL, Chalk River, Ontario, Canada*

The applications of the X-ray fluorescence (XRF) and recoil-free gamma-ray fluorescence (GRF) in non-destructive (non-digestive) analysis of solids sampled on particulate filters in primary and secondary water circuits of nuclear power reactors are presented. The examples of studies of corrosion-product transport in BWR, PWR and PWRH reactors are discussed.

2:55pm

Prepared Discussion: Dr. Dennis Connolly

3:05pm

Closure & Floor Discussion

Tuesday

TECHNICAL SESSIONS

- 3:20pm **IWC-99-53 Report**
Corrosion Behavior in Turbine System Under Neutral Pure Water Condition
Minoru Kobayashi and Hajime Hirasawa, *Toshiba Corporation Power Systems & Services Co., Yokohama, Japan*
- In the latest Advanced Boiling Water Reactor (ABWR) plants, heater drain forward pump-up system is adopted as well as in many fossil plants and Pressurized Water Reactor (PWR) plants. We have obtained extremely low concentration of feedwater iron crud as about 0.1 ppb under neutral pure water condition with oxygen control.
- 3:40pm Floor Discussion
- 3:50-4:10pm **Coffee Break — Sponsored by Epicor Incorporated, Hungerford & Terry Inc. and Thermax Limited**
- 4:10pm **IWC-99-54 Paper**
Deaeration — The Parallel Difference
Bill Runyan and James Abruzzo, *Crane Cochrane, Inc., King of Prussia, PA*
- There have been numerous Deaerator designs used in the Industrial/Utility market since the early 1900's. This paper will review the features that allow PARALLEL DOWNFLOW operation to better handle increasingly difficult design requirements including elevated inlet temperatures, 100% makeup and higher turndown capabilities.
- 4:35pm Prepared Discussion: Eli Salem, *Ecodyne Limited at Graver Water, Cranford, NJ*
- 4:45pm Closure & Floor Discussion
- 5:00pm **IWC-99-55 Paper**
Condensate Polisher Upgrade at Conemaugh Station
Gerald Gall, *GPU/Genco, New Florence, PA*
- Upgrading condensate polishing equipment to improve performance utilizing a multi-skilled design team is cost-effective and achieves excellent results. State-of-the-art computer graphics, electronic control, and ease of training integrate condensate treatment mixed bed resin processing operations at a large, coal-fired power station.
- 5:25pm Prepared Discussion: George Crits, *Aqua-Zeolite Sciences, Inc., Ardmore, PA*
- 5:35pm Closure & Floor Discussion

SOLVING MEMBRANE OPERATIONAL PROBLEMS

2-5PM

GRAND BALLROOM, 17TH FLOOR

Session Chair: Harold Aronovitch, *Hungerford & Terry, Clayton, NY*

Discussion Leader: Wayne Bates, *Hydranautics, Rockton, IL*

IWC Representative: Malcolm Clemens, *Consultant, Pittsburgh, PA*

IWC-99-56 Paper

2:00pm

Design/Build of a 4-mgd Microfiltration, Reverse Osmosis and Mixed Bed Ion Exchange Water Treatment System in New York City

Ian Crossley and Donald Brailey, *Hazen and Sawyer, P.C., New York, NY*; Jim Hoff, *US Filter, Rockford, IL*

This paper describes the development and construction of a sophisticated water treatment plant to provide demineralized water for a power station located in New York City. The project is challenging due, in part, to the initial requirement to use secondary sewage effluent as a water source, use of unfiltered city potable water as a source, very small footprint, and the use of MF and RO membrane processes for water treatment.

2:25pm

Prepared Discussion: Charles Fritz, *Black & Veatch, Overland Park, KS*

2:35pm

Closure & Floor Discussion

IWC-99-57 Paper

2:50pm

The Use of Membrane Technology for the Production of DI Water in Remote & Environmentally Sensitive Areas

David Threlfall, *Ecolochem International, Inc., Peterborough, UK*

World industrialization has driven development in remote and environmentally sensitive areas. The production of DI water has traditionally required large quantities of regenerant chemicals, however the development of a flexible modular membrane deionization system has delivered the "chemical free" DI plant to the industrial market place.

3:15pm

Prepared Discussion: Doug Glanz, *Betz Dearborn Argo Scientific, Cincinnati, OH*

3:25pm

Closure & Floor Discussion

3:40-4:00pm Coffee Break — Sponsored by Epicor Incorporated, Hungerford & Terry Inc. and Thermax Limited

Tuesday

TECHNICAL SESSIONS

- 4:00pm **IWC-99-58 Report**
Applications of Online TOC Analysis for Monitoring Reverse Osmosis Membrane Performance
Karen Clark, *Anatel Corporation, Boulder, CO*; Shane Trussell, *Montgomery Watson Laboratories, Pasadena, CA*
- This paper discusses the use of a new on-line TOC analyzer for monitoring RO membrane performance and integrity. Results demonstrate the ability of this analyzer to detect approximately a 2-3 log removal of TOC with RO membranes. In addition, this real time tool provides a greater degree of sensitivity as compared to other conventional performance monitoring techniques. Correlation of TOC removal with microbial rejection by RO membranes will also be discussed.
- 4:20pm Floor Discussion
- 4:30pm **IWC-99-60 Report**
Improving Thin Film Composite RO Membrane Performance in Biologically Active Waters
Steven Coker, *Dow Chemical, Freeport, TX*; Terry Marsh, *Dow Chemical, Minneapolis, MN*
- System pretreatment and design modifications coupled with innovations in RO element construction and novel bio-fouling resistant membrane chemistry have enable RO technology to be successfully employed in the treatment of bio-active water. This paper will give an overview of the system pretreatment and design characteristics that have been shown to be successful in this application of RO technology.
- 4:50pm Floor Discussion

Wednesday

TECHNICAL SESSIONS

7:30am Registration desk opens, 17th floor

ADVANCES IN ION EXCHANGE TECHNOLOGY

8AM-12PM GRAND BALLROOM, 17TH FLOOR

Session Chair: Ed Nace, *Rohm and Haas Company, Philadelphia, PA*

Discussion Leader: Peter Yarnell, *Graver Chemical Company, Glasgow, DE*

IWC Representative: Andrew Calderwood, *Westinghouse Nuclear Services Division, Madison, PA*

IWC-99-61 Paper

8:00am **Six Years of Short Bed Demineralization at the Ontario Health Science Centre**

Tod Wilson and Bradley Smith, *Eco-Tec Inc., Pickering, Ontario, Canada*; Dwayne Simmons, *TransAlta Energy Corporation*

In 1992, the TransAlta Energy Corporation installed a water demineralization system to supply high-purity water to the then-recently built 68MW cogeneration facility in Ottawa, Canada. After six years of operation, the performance of the system is exceeding design conditions with the original resins, even under high TOC feed conditions.

8:25am Prepared Discussion: Philip Fatula, *Bayer Corporation, Pittsburgh, PA*

8:35am Closure & Floor Discussion

IWC-99-63 Paper

8:50am **Effect of Contact Time on Operating Capacity of Resins**

Uday Datar and Kiran Deshapnde, *Thermax Limited, Pune, India*

This paper reports the experimental results of increasing contact time on operating capacity of resin. All gel type resins showed a reduction in silica leakage and an increase in operating capacity with an increase in contact time. The degree of improvement varied for Type I and Type II resins. A model is being developed to arrive at optimum contact time based on this data.

9:15am Prepared Discussion: Fred Granem, *Mitsubishi Chemical America, Tarrytown, NY*

9:25am Closure & Floor Discussion

9:40-10am **Coffee Break — Sponsored by Thermax Limited**

Wednesday

TECHNICAL SESSIONS

- 10:00am **IWC-99-64 Paper**
Behavior of Silica in Ion Exchange Systems
Peter Meyers, *ResinTech, Inc., Cherry Hill, NJ*
- For demineralizer systems where removal of silica is important, the use of hydroxide form strongly basic anion resin is clearly required. However, there is not much published data on optimizing silica removal in existing equipment systems. Which resin is best? How do caustic dose, concentration, contact time, and temperature affect silica leakage? This paper gathers together the relevant variables and presents a coherent approach to optimizing silica removal by anion exchange resins.
- 10:25am Prepared Discussion
10:40am Closure & Floor Discussion
- 10:55am **IWC-99-65 Report**
Novel Amphoteric Ion Exchange Resin and Its Chromatographic Separation Capability
Go Honda, Tsuyoshi Ito, and Takayuki Tashiro, *Mitsubishi Chemical Corporation, Yokohama, Kanagawa-ken, Japan*; Alan Sharpe, *Mitsubishi Chemical America, Inc., White Plains, NY*
- We will introduce new amphoteric ion exchange resin. The resin has both quaternary ammonium group and carboxyl group attached to crosslinked aromatic polymer structure. Its chromatographic separation capability of several ion species and ion selectivity is summarized and discussed. General properties of the novel resin is also summarized.
- 11:15am Floor Discussion
- 11:25am **IWC-99-62 Report**
Two Years Experience with a Packed Bed System Demineralizing High Silica/Solids Water
Francisco Javier Gomez, *Pemex Refinacion Refineria Miguel Hidalgo, Tula, Hgo, Mexico*; Lemus Noguez Enrique, *Mexico, D.F., Mexico*
- Due to continuous refinery expansions, the Pemex Tula Refinery required to increase their demineralizing systems capacity. The scarcity of water in the region called for a high yield system, the high TDS caused Pemex to predict a high operating cost, and finally the project considered 2 modules of 4 trains each. This paper will show a description of the design and the system installed, a summary of the capacity of leakages obtained plus comments about the operating experience during its' time in operation.
- 11:45am Floor Discussion

INNOVATIVE MEMBRANE PROCESSES

8AM-12PM

WILLIAM PENN BALLROOM, WILLIAM PENN LEVEL

Session Chair: Richard Myers: *DuPont Permassep, Newark, DE*

Discussion Leader: Robert Quinn, *RQ Associates, Inc., Teaneck, NJ*

IWC Representative: Malcolm Clemens, *Consultant, Pittsburgh, PA*

IWC-99-66 Paper

8:00am

A New High Efficiency Reverse Osmosis Process

Shuichi Chino and Isamau Sugiyama, *Nomura Micro Science Co., Ltd., Atsugi-city, Kanagawa, Japan*; Deb Murhoponhyay, *Consulting Chemical Engineer, CA*; Jeffery Holloway, *Kennicott Water Systems Limited, Wolverhampton, UK*

A new high efficiency reverse osmosis process design has been pilot tested in Japan, United Kingdom, and the United States. The process incorporates RO, ion exchange, and decarbonation to achieve very high recovery, and very high rejection of dissolved constituents. Capital and operating costs are substantially lower as well.

8:25am

Prepared Discussion: C. Sean Taufer, *Membrane Systems Corp., San Diego, CA*

8:35am

Closure & Floor Discussion

IWC-99-67 Paper

8:50am

Improving RO Permeate Quality Through Permeate Recycling and the Use of a High Silica Rejection Membrane

John Kim, PE, Ph.D., *Riverbend Steam Station, Duke Power Co., Mount Holly, NC*; Robbin Jolly, *Allen Steam Station, Duke Power Co., Belmont, NC*

After 15 months of operation with a polyamide-urea copolymer (high silica rejection) thin film composite membrane, the RO still exhibits excellent silica removal, yielding over 99 percent reduction (50 ppb from 6.5 ppm). Approximately 25 percent of the silica reduction is attributed to permeate recycling.

9:15am

Prepared Discussion: Robert Allison, *Ionics, Inc., Watertown, MA*

9:25am

Closure & Floor Discussion

9:40-10am

Coffee Break — Sponsored by Thermax Limited

Wednesday

TECHNICAL SESSIONS

- 10:00am **IWC-99-68 Paper**
Low Level Deoxygenation of Boiler Makeup Water Using Gas Transfer Membranes
Patrick Kinghorn, *Ecolochem, Inc., Houston, TX*
- This paper focuses on producing low level deoxygenated boiler feed water by relying solely on a membrane process. Information on system design and effluent performance will be demonstrated, proving gas transfer membranes are a viable process for deoxygenating water to less than 15 ppb dissolved oxygen.
- 10:25am Prepared Discussion: Brian Miller, *Celgard, Charlotte, NC*
- 10:35am Closure & Floor Discussion
- 10:50am **IWC-99-69 Paper**
Effective Deoxygenation by a Hybrid Process Combining Gas Transfer Membranes with Catalytic Oxygen Reduction
Scott Gorry, *Ecolochem, Inc., East Hartford, CT*; William Haas, *Ecolochem, Inc., Norfolk, VA*
- This paper will focus on the deoxygenation of RO permeate by a hybrid process. It will discuss the roles that each technology plays in deoxygenation and will describe the benefits allowed by combining them. The paper will also examine the role that the hybrid process plays in the overall TOC reduction by the system.
- 11:15am Prepared Discussion
- 11:25am Closure & Floor Discussion

MICROBIOLOGICAL CONTROL

8AM-12PM **MONONGAHELA ROOM, 17TH FLOOR**

Session Chair: Richard Lutey, *Buckman Laboratories, Inc., Memphis, TN*

Discussion Leader: Wayne Micheletti, *Wayne Micheletti Inc., Charlottesville, VA*

IWC Representative: Joseph Venzon, *Duquesne Light Company, Pittsburgh, PA*

- 8:00am **IWC-99-70 Report**
A New, Single-Feed, Liquid Bromine Biocide for Disinfection of Industrial Water Systems
Jonathan Howarth and Chris Nalepa, *Albemarle Corp, Baton Rouge, LA*
- A new-generation, single-feed, liquid bromine biocide has been developed for disinfection of industrial water systems. Data are presented which demonstrates the microbiological efficacy of the product against a whole array of target organisms. A case history featuring the use of the material to treat a medium-sized cooling tower is described.
- 8:20am Floor Discussion

Wednesday

TECHNICAL SESSIONS

- 8:30am **IWC-99-71 Paper**
Detection and Reduction of Biofilms in Industrial Cooling Waters
Edward Beardwood, *Drew Canada, Div. of Ashland Canada Inc., Ajax, Ontario, Canada*
- The fouling and corrosion associated with sessile bacterial development of biofilms continues to be an area of concern. A portable on-line corrosion and fouling monitor was utilized to provide early detection of biofilm formation and subsequent detection of biofouling reduction. A number of key points and factors influencing the detection and performance of foulant reduction will be presented.
- 8:55am Prepared Discussion: John Garey, *Bridger Scientific, Inc.*
9:05am Closure & Floor Discussion
- 9:20-9:40am Coffee Break — Sponsored by Thermax Limited**
- 9:40am **IWC-99-72 Report**
A Report on MIC Activities at TMI
Russ Green, *GPU Nuclear, Middletown, PA*
- Examples of areas with advanced MIC will be discussed in relation to system usage and tracking techniques. Additional examples and discussion on the following items will be included: Microbiologically "Influenced" Corrosion, Microbiologically "Induced" Corrosion, Fluid Velocity Effects, and Heat Treatment Results.
- 10:00am Floor Discussion
- 10:10am **IWC-99-73 Paper**
Degradation of Skimmer Drive Chains in the Primary Clarifiers of a Municipal Waste Treatment Plant Due to Microbiologically Influenced Corrosion (MIC)
James Scutti, *Massachusetts Materials Research, Inc., W. Boylston, MA*
- The drive chains used in the covered primary clarifiers of a municipal waste treatment plant located in the northeast are sustaining significant corrosion and wear. Drive chain segments of 403 and 304 stainless steels were removed from service and analyzed for the cause of the degradation. The sludge, grit, influent water and head space gas (H₂S) from the clarifiers were also analyzed and correlated to the degradation.
- 10:35am Prepared Discussion: Stephen Lamb, *Nickel Development Institute, Huntington, WV*
10:45am Closure & Floor Discussion

Wednesday

TECHNICAL SESSIONS

- 11:00am **IWC-99-74 Report**
Allied Signal Sprinkler System Remediation Project
Myron Shenkir, *Herc Products Inc., Phoenix, AZ*
- Allied Signal Aerospace became concerned with MIC in their fire protection systems when it was found to have created a pinhole leak in a wet sprinkler system. An evaluation of the system indicated that the bacteria that cause MIC were present in the water while nodules (tubercles) were observed in the pipe samples. The system was chemically cleaned to remove the nodules following by a disinfectant treatment program to prevent reoccurrence of MIC.
- 11:20am Floor Discussion

POWER PLANT MONITORING

8AM-12PM **URBAN ROOM, 17TH FLOOR**

Session Chair: James Dromgoole, *Fort Bend Services, Inc., Stafford, TX*

Discussion Leader: Torry Tvedt, *Puckorius & Associates, Angleton, TX*

IWC Representative: Kathleen Lagnese, *Aristech Chemical Corporation, Pittsburgh, PA*

- 8:00am **IWC-99-79 Paper**
Representative Sampling in the Steam Cycle of a Power Plant
James Groose, *Sentry Equipment Corp., Oconomowoc, WI*

The guidelines for obtaining a representative steam or water sample from the high purity water circulating within the power cycle of a power plant will be discussed. Issues to maintain the integrity of the sample in a cycling environment will be outlined while ways to keep the overall accuracy of the analysis will also be elaborated upon.

- 8:25am Prepared Discussion: Mark Janick, *Baltimore Gas & Electric Company, Baltimore MD*
- 8:35am Closure & Floor Discussion

- 8:50am **IWC-99-75 Report**
pH Measurements in a Power Plant
Shane Filer, *Honeywell, Fort Washington, PA*; Mark Janick, *Baltimore Gas and Electric, Baltimore, MD*; Donald Vinnicombe, *Earthwater Technologies, Africa*; Gary Hinds, *Texas Utilities Electric Co., Glen Rose, TX*; Bill Boyd, *Kincaid Generation, Kincaid, IL*

The measurement of pH is vital to power plant applications such as reverse osmosis pretreatment, scrubbers, cooling towers, boiler feedwater and condensate and waste water treatment. Concerns with the method of mounting, process flowrate, pH range, temperature, contaminant level, and chemical composition must be

Wednesday

TECHNICAL SESSIONS

evaluated in order to choose the best pH probe for each application. Recommendations for choosing the best pH electrode for each application will be made.

9:10am Floor Discussion

9:20-9:45am Coffee Break — Sponsored by Thermax Limited

IWC-99-76 Report

9:45am Specific Conductivity Temperature Compensation
David Gray and Anthony Bevilacqua, Ph.D., *Thornton Associates, Inc., Waltham, MA*

Our Report at IWC '97 disclosed significant errors in cation conductivity temperature compensation algorithms used in on-line instruments and a significant improvement. Presented here is a continuation of that work to show the performance of temperature compensation algorithms applied to specific conductivity with ammonia treatment. Performance of an improved algorithm is illustrated.

10:05am Floor Discussion

IWC-99-77 Paper

10:15am Practical Corrosion Measurement Techniques for Steam Condensate Systems

Daniel Cicero, Nalco Chemical Company, Naperville, IL

This paper will survey the practical corrosion measurement tools developed over the past fifty years. Emphasis will be on their practical use and expected results. Corrosion rate data will also be presented. From this, individuals interested in measuring corrosion rates in their condensate systems should be well equipped to choose an appropriate method and evaluate their results.

10:40am Prepared Discussion: Steve Shulder, *Baltimore Gas & Electric, Baltimore, MD*

10:50am Closure & Floor Discussion

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Since 1955, companies have sponsored suites which provide technical information and business assistance. These informal meetings with experienced, knowledgeable experts help with problem solving, discovering new products and processes and new applications. You meet some very interesting people, too.

AEA TECHNOLOGY ENGINEERING SOFTWARE, INC.

Sewickley Room, 1st Floor

Contact: Marion Maniet, *Product Manager*

2000 Oxford Drive, Suite 610

Bethel Park, PA 15102

Tele: 412-833-4820

Fax: 412-833-4580

E-mail: marion.maniet@engsw.aeat.com

AEA Technology Engineering Software and its Hyprotech division provide software tools to develop and optimize plants and processes, enhance projects, meet safety requirements, and manage environmental challenges. Featured at this year's IWC is EpSelon, the knowledge base, expert system and coating software for wastewater treatment and CFX for Computational Fluid Dynamics.

Monday Hours: 11:30 a.m. - 10:00 p.m.

Tuesday Hours: 11:30 a.m. - 10:00 p.m.

ALBEMARLE CORPORATION

Room #665, 6th Floor

Contact: Kim L. Cupples

451 Florida Street

Baton Rouge, LA 70801

Tele: 225-388-7122

Fax: 225-388-7848

E-mail: kim_cupples@albemarle.com

Albemarle Corporation is a specialty chemicals manufacturer with focus in biocides and surfactants. Products include STABROM and SANIBROM biocides, amine derivatives, and quats.

Monday Hours: 7:00 p.m. - 9:00 p.m.

Tuesday Hours: 5:00 p.m. - 9:00 p.m.

ALBRIGHT & WILSON

Churchill Room, 1st Floor

Contact: Brian K. Failon, *Sr. Product Manager*

P.O. Box 4439

Glen Allen, VA 23058-4439

Tele: 804-968-6446

Fax: 804-968-6545

E-mail: bfailon@albright-wilson.com

Albright & Wilson manufactures a diverse range of performance products worldwide, with strategic chemistry centering around organic and inorganic phosphorus derivatives. Its Water Management Chemicals business supplies raw materials for water treatment, primarily biocides and scale/corro-

sion inhibitors. Featured products include the award-winning Bricorr 288 all-organic corrosion inhibitor and TOLCIDE PS biocides.

Monday Hours: 5:00 p.m. - 7:00 p.m. & 9:00 p.m. - 11:00 p.m.
Tuesday Hours: 5:00 p.m. - 7:00 p.m. & 9:00 p.m. - 11:00 p.m.

ALCO CHEMICAL, DIV. NATIONAL STARCH AND CHEMICAL CO. Room #727, 7th Floor

Contact: Michael L. Standish, *Project Supervisor*
909 Mueller Drive
P.O. Box 5401
Chattanooga, TN 37406
Tele: 423-629-1405 Ext. 233
Fax: 423-698-8723

Provider of polymers for scale and deposit control for cooling towers, boilers, pulp & paper mills and other industrial process waters, industrial microbiocides for industrial process waters. Metal precipitants for removal of heavy metal.

Sunday Hours: 5:30 p.m. - 11:00 p.m.
Monday Hours: 5:00 p.m. - 11:00 p.m.
Tuesday Hours: 5:00 p.m. - 11:00 p.m.

AMBI-DESIGN, INC.

Room #618, 6th Floor

Contact: Shan S. Sundaram, P.E., *President*
4654 Crested Butte Trail
Rockford, IL 61114
Tele: 815-964-7568
Fax: 815-654-3540

Ambi-Design, Inc. designs, engineers and builds custom designed large water treatment, chemical purification/recovery and wastewater treatment systems. ADI is a leading expert in systems retrofits and fabrication of internal distributors (CPVC, SST, Alloy 20, Hastelloy C-276) with polypropylene and wedgewire screens.

Sunday Hours: 5:00 p.m. - 10:00 p.m.
Monday Hours: 2:00 p.m. - 11:00 p.m.
Tuesday Hours: 9:00 a.m. - 11:00 p.m.
Wednesday Hours: 8:00 a.m. - 11:00 a.m.

AQUATECH INTERNATIONAL CORPORATION

Riverboat Room, William Penn Level

Contact: Karin L. Brightwell, *Marketing Coordinator*
One Four Coins Drive
Canonsburg, PA 15317
Tele: 724-5300
Fax: 724-746-5359
E-mail: aic@aquatech.com

Aquatech International Corporation specializes in the design, manufacturing, installation and servicing of industrial water and wastewater treatment systems worldwide for a wide range of industrial applications. Aquatech is a single source for water treatment needs and supplies a wide range of process equipment including: Ion Exchange, Membrane Pretreatment, Ultra-pure, and Wastewater.

Sunday Hours: 5:00 p.m. - 9:00 p.m.
Monday Hours: 10:00 a.m. - 8:00 p.m.
Tuesday Hours: 10:00 a.m. - 8:00 p.m.

ASHLAND SPECIALTY CHEMICAL COMPANY/DREW INDUSTRIAL DIVISION

Room #1503, 15th Floor

Contact: Joan Tiedrich, *Marketing Services Admin.*
One Drew Plaza
Boonton, NJ 07005
Tele: 973-263-7949
Fax: 973-263-4483

Ashland Specialty Chemical's Drew Industrial Division is a leader in specialty chemicals and services for industrial water and fuel treatment, wastewater treatment, commercial and industrial water treatment, pulp and paper processing, mining and geothermal applications and paint, latex, ink and adhesive formulations. Our World Wide Web site (<http://www.ashspec.com>) offers a comprehensive source of information about our company's numerous divisions, products, capabilities and services. While at the Web-site, be sure to visit our technical forum located at <http://www.ashspec.com/di.html>. The forum is provided as a vehicle for visitors to the Web site to pose questions that are answered by Drew Industrial's technical staff.

Sunday Hours: 5:00 p.m. - 11:00 p.m.
Monday Hours: 5:00 p.m. - 11:00 p.m.
Tuesday Hours: 5:00 p.m. - 11:00 p.m.

BAYER CORPORATION

Frick Room, Conference Level

Contact: Tony J. DeCola, *Product Manager*
100 Bayer Road
Pittsburgh, PA 15205-9741
Tele: 412-777-7464
Fax: 412-777-4109
E-mail: tony.decola.b.@Bayer.com

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resins for industrial, utility and wastewater applications. Visit our Info-Share Suite to discuss your application and see our pilot WS / Schwebbett unit in operation, demonstrating Bayer's 40 years of experience in packed bed / fluidized bed technology. Bayer's water treatment product line also includes Bayhibit AM scale inhibitor, Preventol CI copper corrosion inhibitor and hydrazine. New biodegradable products (per OECD definition) are also now available that include polyaspartic acid sodium salt, a dispersing/sequestering agent and iminodisuccinate, a metal chelator.

Sunday Hours: 6:00 p.m. - 10:00 p.m.

Monday Hours: 5:00 p.m. - 11:00 p.m.

Tuesday Hours: 5:00 p.m. - 11:00 p.m.

BETZDEARBORN INC.

Grant Suites, Mezzanine

Contact: Clovis Sarmiento, *Global Marketing Manager*

200 Witmer Road

Horsham, PA 19044

Tele: 215-773-6270

Fax: 215-773-6133

Water Treatment Products and Engineering Services for Boiler, Process Cooling, HVAC, Influent and Waste Water Treatment Systems.

Sunday Hours: 6:00 p.m. - 11:00 p.m.

Monday Hours: 10:00 a.m. - 2:00 p.m. & 4:00 p.m. - 11:00 p.m.

Tuesday Hours: 10:00 a.m. - 2:00 p.m. & 4:00 p.m. - 11:00 p.m.

BUCKMAN LABORATORIES, INC.

Room #678, 6th Floor

Contact: Michael N. Charnigo, *Group Business Manager*

1256 North McLean Blvd.

Memphis, TN 38108-0305

Tele: 901-278-0330

Fax: 901-726-5970

E-mail: mncharnigo@buckman.com

Buckman Laboratories supplies raw materials and intermediates to companies who formulate products for the Water Treatment Industry. Along with their products, Buckman offers strong customer support and mature field force that carries a proven history of dependability and creative support and a mature field force that carries a proven history of dependability and creative problem solving techniques for their customers.

Monday Hours: 5:00 p.m. - 11:00 p.m.

Tuesday Hours: 5:00 p.m. - 11:00 p.m.

CALGON CORPORATION

Oakmont Room, 1st Floor

Contact: Pat Gill, *Manager, Technology Applications Services — Boiler & Cooling Water*

Box 1346

Pittsburgh, PA 15230

Tele: 412-494-8190

Fax: 412-494-8224

E-mail: pgill@ecc.com

Calgon will display its capabilities in corrosion control, scale inhibition, liquid-solid separation, biological control and macrofouling, as well as its capabilities in equipment and related services.

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Monday Hours: 4:00 p.m. - 11:00 p.m.

Tuesday Hours: 4:00 p.m. - 11:00 p.m.

THE CAPITAL CONTROLS GROUP

Conference Center C, Conference Level

Contact: Richard A. Mitman, *Manager, Marketing Services*

P.O. Box 211

Colmar, PA 18915

Tele: 215-997-4031

Fax: 215-997-4062

E-mail: rmitman@capitalcontrols.com

Capital Controls is the leading supplier of disinfection systems utilizing chlorine, sodium hypochlorite, chlorine dioxide, ammonia, sulfur dioxide, carbon dioxide, chemical metering systems, ultraviolet systems and dry/liquid polymer feed systems for water and wastewater treatment.

Also, provides on-line microprocessor based monitors for free or total chlorine, ammonia, phosphate, manganese, iron, fluoride, nitrate, pH, dissolved oxygen, conductivity and temperature.

Capitol Controls also designs complete systems and provides service support of equipment for industrial treatment systems.

Sunday Hours: 6:00 p.m. - 9:00 p.m.

Monday Hours: 11:00 a.m. - 6:00 p.m.

Tuesday Hours: 11:00 a.m. - 6:00 p.m.

COCHRANE, INC. — CRANE CO.

Room #966, 9th Floor

Contact: Bill Runyan, *Technical Sales – Water Treatment*

800 Third Avenue

King of Prussia, PA 19406

Tele: 1-800-633-7435

Fax: 610-265-5432

E-mail: runyan@cochrane.com

COCHRANE has devoted over 130 years to the development of quality water treatment equipment. Based in King of Prussia, PA., with manufacturing sites in Venice, Florida and Thorofare, New Jersey, Cochrane de-

signs and manufactures total water management systems including; Membrane-Based Filtration, Deaerators, Demineralizers, Condensate Polishers, Softeners, Filters, Condensate Return Systems, Steam Relief Valves & Exhaust Heads, and Commercial Water Treatment Products.

Monday Hours: 10:00 a.m. - 9:00 p.m.

Tuesday Hours: 10:00 a.m. - 9:00 p.m.

THE DOW CHEMICAL COMPANY

Three Rivers Complex, William Penn Level

Liquid Separations Customer Information Group

P.O. Box 1206

Midland, MI 48641-1206

Tele: 1-800-447-4369 or 517-832-1556

Fax: 517-832-1465

E-mail: dowcig@dow.com

The Liquid Separations Department of The Dow Chemical Company is in a unique position as a leading supplier of both reverse osmosis and ion exchange water treatment technologies. Our suite will highlight recent innovations and updates in DOWEX ion exchange resins, the UPCORE system and FILMTEC reverse osmosis elements.

Monday Hours: 4:30 p.m. - 8:00 p.m.

Tuesday Hours: 4:30 p.m. - 7:30 p.m.

E-CELL CORPORATION

Lafayette Room, 11th Floor

Contact: Jan d'Ailly, *Marketing Manager*

52 Royal Road

Guelph, Ontario, N1H 1G3 Canada

Tele: 519-836-0500

Fax: 519-836-9373

E-mail: jdailly@ecell.com

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E-cell™ technology enables the production of pure water with a 95% reduction in chemical use as compared to traditional water treatment systems. E-cell™ is a revolution in electrodeionization (EDI) that delivers high quality water for boiler feedwater and high purity applications at flow rates up to 2,000 GPM and beyond. This innovative technology offers a host of benefits: no regeneration chemicals, continuous simple operation, predictable water quality and no hazardous waste stream.

E-cell™'s proven technology is an alternative to mixed bed deionization, and is available through water treatment companies worldwide.

Monday Hours: 5:00 p.m. - 10:00 p.m.

Tuesday Hours: 5:00 p.m. - 10:00 p.m.

ECODYNE LIMITED

Parlor E & F, 17th Floor

Contact: Craig Lockhart, *Regional Manager*
4475 Corporate Drive
Burlington, Ontario, Canada L7L 5T9
Tele: 908-653-4200
Fax: 908-653-4300
Email: clockhart@graver.com

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

Sunday Hours: 5:30 p.m. - 8:30 p.m.
Monday Hours: 11:30 a.m. - 8:00 p.m.
Tuesday Hours: 11:30 a.m. - 8:00 p.m.

ECOLOCHEM, INC.

Room #627, 6th Floor

Contact: Paul C. Hoppenjans, *Marketing Services Manager*
4545 Patent Road
Norfolk, VA 23502
Tele: 757-855-9000
Fax: 757-855-1478
E-mail: paul.hoppenjans@ecolochem1.com

Outsourced water treatment systems for emergency to long term needs, featuring new technologies such as Gas Transfer Membranes, Ceramic Membrane Microfiltration, and the DeltaFlow™ System which produces ultrapure water without chemicals. Ask us about no-cost technology upgrades and "High Purity Security®" available through outsourcing.

Sunday Hours: 5:00 p.m. - Midnight
Monday Hours: 1:00 p.m. - Midnight
Tuesday Hours: 1:00 p.m. - Midnight

ELECTRO PURE INC.

Carnegie Room 2, Conference Level

Contact: Michael Snow, *General Manager*
23456 South Pointe Drive
Laguna Hills, CA 92653
Tele: 949-770-9347
Fax: 949-770-9209
E-mail: info@electropure-inc.com

Electropure supplies EDI components to qualified water equipment OEMs. Electropure introduces its new, low-cost, high-quality EDI product series "XL by Electropure". The newly-designed XL modules have flow rates from <1/2gpm up to 10gpm. This product line allows OEMs to build and sell high quality EDI systems up to 100gpm competitively and profitably.

Monday Hours: 11:30 a.m. - 8:00 p.m.
Tuesday Hours: 11:30 a.m. - 8:00 p.m.

ENVIRONMENTAL DYNAMICS CORPORATION

Room #718, 7th Floor

Contact: Nancy Gleasman-Foor, *General Manager*
210 New Factory Road
Sharon, WI 53585
Tele: 815-737-8634
Fax: 815-737-8734

Complete line of water treatment equipment including filtration, ion exchange, and reverse osmosis for production of pure water for the power, pharmaceutical, semiconductor, and other industries.

Sunday Hours: 6:00 p.m. - 11:00 p.m.
Monday Hours: 5:00 p.m. - 11:00 p.m.
Tuesday Hours: 5:00 p.m. - 11:00 p.m.

EPICOR, INCORPORATED

Royal Room, 15th Floor

Contact: Rose Bussiculo, *President*
1414 East Linden Avenue
P.O. Box 1608
Linden, NJ 07036
Tele: 908-925-0800
Fax: 908-925-7795
E-mail: epicorinc@aol.com

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

FMC CORPORATION / BIO LAB

Conference Center A, Conference Level

Contact: Paul Turgeon, *Sales and Marketing Manager*
1735 Market Street
Suite 1873
Philadelphia, PA 19103
Tele: 215-299-6043
Fax: 215-299-6962

FMC's Process Additives Division offers a wide range of specialty, industrial water additives including scale, corrosion, and microbiocide inhibitors. For more information, please visit our Conference Center A Suite located on the Conference Level of the Westin William Penn.

Monday Hours: 5:00 p.m. - 11:00 p.m.
Tuesday Hours: 5:00 p.m. - 11:00 p.m.

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GLEGG WATER CONDITIONING, INC.

Room #1650, 16th Floor

Contact: Jan d'Ailly, *Marketing Manager*
29 Royal Road
Guelph, Ontario N1H 1G2 Canada
Tele: 519-836-0500
Fax: 519-836-9373
E-mail: jdailly@glegg.com

Glegg Water Conditioning, Inc. is a worldwide supplier of water treatment and purification equipment for industrial operations, specializing in the steam generation and high purity applications.

Key markets include the electronics, pharmaceutical, power generation, petrochemical/refinery, pulp and paper and general industry.

Products include filtration, membrane processes, degasification, electro-dionization/E-cell, sterilization and chemical dosing.

Monday Hours: 5:00 p.m. - 10:00 p.m.
Tuesday Hours: 5:00 p.m. - 10:00 p.m.

GRAVER TECHNOLOGIES

Conference Center E, Conference Level

Contact: Mark Koster, *V.P. Domestic Utility Sales*
200 Lake Drive
Glasgow, DE 19702
Tele: 302-731-1700
Fax: 302-731-1707
E-mail: mkoster@gravertech.com

Graver Technologies (formerly Graver Chemical Company) provides Gravex(R), Powdex(R), and Ecodex(R) powdered ion exchange resins; whole bead resins manufactured by major ion exchange companies; Aegis(R) precoat filters and septa, AFA(TM) pleated filters, Dualguard(TM) filters and Scepter(R) sintered metal membranes. We specialize in condensate make-up and all other water purification systems in utility power plants.

Sunday Hours: 6:00 p.m. - 9:00 p.m.
Monday Hours: 9:00 a.m. - 8:00 p.m.
Tuesday Hours: 9:00 a.m. - 8:00 p.m.

GRAVER WATER SYSTEMS, INC.

Parlor E & F, 17th Floor

Contact: Craig Lockhart, *Regional Manager*
750 Walnut Avenue
Cranford, NJ 07016
Tele: 908-653-4200
Fax: 908-653-4300
E-mail: clockhart@graver.com

Graver Water Systems, Inc. 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.

Sunday Hours: 5:30 p.m. - 8:30 p.m.
Monday Hours: 11:30 a.m. - 8:00 p.m.
Tuesday Hours: 11:30 a.m. - 8:00 p.m.

HACH COMPANY

Conference Center B, Conference Level

Contact: James Hensel, *Applications Engineer*
P.O. Box 389
Loveland, CO 80539-0389
Tele: 970-669-3050, ext. 2712
Fax: 970-669-2932

HACH COMPANY is a global supplier of instruments and reagents for a wide variety of environmental and water quality testing applications. Hach's product offerings include bench-top systems for laboratory testing, on-line systems for around-the-clock monitoring, portable systems for field analysis and microbiological testing. Hach systems for analysis are backed by proven methods, premeasured reagents and complete after-sale support and service.

Monday Hours: 11:30 a.m. - 1:30 p.m. & 4:00 p.m. - 7:00 p.m.
Tuesday Hours: 11:30 a.m. - 1:30 p.m. & 4:00 p.m. - 7:00 p.m.

HONEYWELL INC.

Heinz Room, Conference Level

Contact: Shane Filer, *Application Engineer*
1100 Virginia Drive
Fort Washington, PA 19034
Tele: 215-641-3788
Fax: 215-641-3599
E-mail: shane.t.filer@iac.honeywell.com

Honeywell utilizes 100+ years of application and technology expertise to produce unique sensor technology to measure and control pH, conductivity, resistivity, dissolved oxygen and ORP. This year we are showcasing Durafet® II, the next generation non-glass pH electrode.

Sunday Hours: 7:00 p.m. - 9:00 p.m.
Monday Hours: 12:00 p.m. - 2:00 p.m. & 6:00 p.m. - 9:00 p.m.
Tuesday Hours: 12:00 p.m. - 2:00 p.m. & 6:00 p.m. - 9:00 p.m.
Wednesday Hours: 12:00 p.m. - 1:00 p.m.

HYDROCHEM INDUSTRIAL SERVICES

Room #616, 6th Floor

Contact: John Sullivan, *Manager*
428 Thacher Lane
Youngstown, OH 44515
Tele: 330-792-6569
Fax: 330-792-1474

HydroChem provides a full line of industrial services to power plants around the world: chemical cleaning, hydroblasting, vacuum services, commissioning services and waste minimization. Ask about our turbine foam cleaning. No other services company can match HydroChem's variety of solvent systems, broad range of equipment, state-of-the-art technology and safety record.

Sunday Hours: 4:00 p.m. - 10:00 p.m.
Monday Hours: 5:00 p.m. - 10:00 p.m.
Tuesday Hours: 5:00 p.m. - 10:00 p.m.

INFILCO DEGREMONT, INC.

Room #1603, 16th Floor

Contact: Marek K. Mierzejewski, *Manager, Industrial Systems*
2924 Emerywood Parkway
Richmond, VA 23294
Tele: 804-756-7686
Fax: 804-756-7830
E-mail: mierzewskim@idi-online.com

IDI is a long established water and wastewater technology / equipment provider to industry. We can provide single process units, through integrated systems, to full design/build facilities. New technologies developed in R&D Centers in Europe and the new DENARD facility in Virginia. Contact Marek Mierzejewski for industrial applications.

Sunday Hours: 8:00 p.m. - 11:00 p.m.
Monday Hours: 9:00 a.m. - 11:00 p.m.
Tuesday Hours: 9:00 a.m. - 11:00 p.m.

IONICS, INCORPORATED

Allegheny Room, 17th Floor

Contact: Francine S. Bernitz, *V.P.Corp. Marketing & Communications*
65 Grove Street
Watertown, MA 02472
Tele: 617-926-2500
Fax: 617-926-4304
E-mail: fbernitz@ionics.com

Ionics is the industry leader in delivering the *right* water purification solutions for people, industry and our environment. From state-of-the-art water treatment equipment, like Ionics EDI, to evaporators and crystallizers for zero liquid discharge systems, to water quality monitoring instrumentation using the Sievers® PPT analyzer, Ionics offers **fully integrated water solutions** for industrial water applications. Chart *your* course with Ionics.

Monday Hours: 7:30 a.m. - 10:00 a.m. & 4:00 p.m. - 6:30 p.m.
Tuesday Hours: 7:30 a.m. - 10:00 a.m. & 6:00 p.m. - 10:00 p.m.

JOHNSON MARCH SYSTEMS, INC.

Oliver Room, Conference Level

Contact: Bill Herbert, *Sales Manager*

220 Railroad Drive

Ivyland, PA 18974

Tele: 215-364-2500

Fax: 215-364-5425

E-mail: JMARCH@IBM.NET

Custom Steam/Water Sampling Panels, Skid-Mounted Chemical Dosing Systems to inject boiler, cooling water, process additives including polymers, liquid chlorine, hypochlorite (purchased and from seawater).

Sunday Hours: 5:00 p.m. - Midnight

Monday Hours: 8:30 a.m. - Midnight

Tuesday Hours: 8:30 a.m. - Midnight

Wednesday Hours: 8:30 a.m. - 11:30 a.m.

MECO

Room #669, 6th Floor

861 Carondelet Street

New Orleans, LA 70130

Tele: 504-599-4000

Fax: 504-599-4100

MECO (Mechanical Equipment Company, Inc.) is a world leader in the design, manufacture and service of water purification plants. Processes and equipment includes filtration, reverse osmosis, ion exchange, mechanical and thermal vapor compression, multiple effect, pure steam generators, multi-stage flash and marine heat exchangers and pumps.

Sunday Hours: 8:00 p.m. - 11:00 p.m.

Monday Hours: 12:00 p.m. - 10:00 p.m.

Tuesday Hours: 12:00 p.m. - 10:00 p.m.

MITSUBISHI CHEMICAL AMERICA, INC.

Phipps Room, Conference Level

Contact: Alan D. Sharpe, *General Manager*

1 North Lexington Avenue, 16th Floor

White Plains, NY 10601

Tele: 914-286-3625

Fax: 914-681-0995

E-mail: alan_sharpe@m-chem.com

Mitsubishi Chemical America offers over 50 years of manufacturing experience with over 200 grades of Diaoxin exchange resins and synthetic ad solvents for industrial water and waste water applications.

Sunday Hours: 7:00 p.m. - 10:00 p.m.

Monday Hours: 6:00 p.m. - 11:00 p.m.

Tuesday Hours: 6:00 p.m. - 11:00 p.m.

MPW WATER MANAGEMENT GROUP

Vandergrift Room, Conference Level

Contact: Dale Campion, *General Manager*

150 South 29th Street

Newark, OH 43055

Tele: 800-842-4355

Fax: 740-344-7715

E-mail: dcampion@mpwservices.com

MPW Water Management Group specializes in providing water purification services to industrial facilities. Our customer base includes electrical utilities, food, chemical, steel, pulp & paper, pharmaceutical, and microelectronics. We provide mobile units to meet short-term and emergency needs. On a longer term basis, our Management of Pure Water Plan provides pure water through a MPW Water Management Group owned and operated system. The MPW plan supplies your required pure water at a guaranteed cost, quality, and quantity with no capital investment.

Sunday Hours: 7:00 p.m. - 11:00 p.m.

Monday Hours: 4:00 p.m. - 11:00 p.m.

Tuesday Hours: 4:00 p.m. - 11:00 p.m.

NALCO CHEMICAL COMPANY

Presidential Suite 1666, 16th Floor

Contact: Wayne Bernahl, *Senior Consultant*

One Nalco Center

Naperville, IL 60563-1158

Tele: 630-305-1407

Fax: 630-305-2933

E-mail: wbernahl@nalco.com

Nalco Chemical Company is the world's largest supplier of specialty chemicals and services for water and industrial process treatment. Nalco engages in the research, development, manufacture, distribution and application of highly specialized chemical programs and services.

Sunday Hours 6:00 p.m. - 10:00 p.m.

Monday Hours: 4:30 p.m. - 11:00 p.m.

Tuesday Hours: 4:30 p.m. - 11:00 p.m.

ORBISPHERE LABORATORIES

Room #746, 7th Floor

Contact: Kenneth J. Kuruc, *Regional Sales Engineer*

865 Cummings Ct.

Medina, OH 44256

Tele: 330-723-0220

Fax: 330-723-1442

E-mail: orbilabs@aol.com

Instrumentation and integrated modules for measuring dissolved oxygen, hydrogen, and ozone in power (fuel & nuclear), pulp/paper, chemical and ultrapure water applications.

Monday Hours 4:00 p.m. - 8:00 p.m.

Tuesday Hours 4:00 p.m. - 8:00 p.m.

OSMONICS

Room #765, 7th Floor

Contact: Curt Weitnauer, *Customer Products Systems and Service Business Unit General Manager*

5951 Clearwater Drive

Minnetonka, MN 55343

Tele: 612-933-2277

Fax: 612-933-0141

Osmonics is a manufacturer and worldwide supplier of equipment and components that purify water and separate fluids. Our complete line of water treatment technologies includes crossflow membrane filtration, electrodeionization, media filtration, and ozonation. The company manufactures all of the major components, including depth filters, pumps, control valves, pretreatment systems, and housings. Visit our web site at www.osmonics.com.

Monday Hours: 4:00 p.m. - 10:00 p.m.

Tuesday Hours: 4:00 p.m. - 10:00 p.m.

PHILIP SERVICES CORP.

Room #637, 6th Floor

Contact: Paul Davis, *Sr. Account Manager*

6059 Mission Drive

West Bloomfield, MI 48324

Tele: 248-360-0657

Fax: 248-360-7941

E-mail: Pedserv@aol.com

PSC, Chemical Products & Services is the North American market leader in providing advanced chemical cleaning and project design technologies. The Chemical Products and Services technology center includes a scale and contaminant processing laboratory which provides advanced technical support to all PSC chemical cleaning operations.

Monday Hours: 5:00 p.m. - 9:00 p.m.

Tuesday Hours: 5:00 p.m. - 9:00 p.m.

PROMINENT FLUID CONTROLS, INC.

Laughlin Room, Conference Level

Contact: Mike St. Germain, *Manager, OEM Accounts*

136 Industry Drive

Pittsburgh, PA 15275-1014

Tele: 630-428-3466

Fax: 630-428-3468

E-mail: mstg@compuserve.com

Global manufacturer of chemical metering pumps, process controllers/sensors and engineered chemical feed and control systems.

Monday Hours: 3:00 p.m. - 10:00 p.m.

Tuesday Hours: 3:00 p.m. - 10:00 p.m.

PUROLITE COMPANY

Renaissance Room #866, 8th Floor

Contact: Jim Sabzali, *Director of Sales and Marketing*

150 Monument Road

Bala Cynwyd, PA 19004

Tele: 610-668-9090

Fax: 610-668-8139

E-mail: purobala@internetmci.com

Purolite is a world leader in ion exchange resins and polymeric adsorbents

Sunday Hours: 5:00 p.m. - 10:00 p.m.

Monday Hours: 5:00 p.m. - 11:00 p.m.

Tuesday Hours: 5:00 p.m. - 11:00 p.m.

RESINTECH INC.

Room #1636, 16th Floor

Contact: Frank DeSilva, *National Sales Manager*

615 Deer Road

Cherry Hill, NJ 08034-1409

Tele: 609-354-1152

Fax: 609-354-6337

E-mail: ixresin@resintech.com

ResinTech is a manufacturer of ion exchange resins and activated carbon. This year ResinTech is showcasing their line of low TOC resins, including ResinTech MBD-ULTRA, the highest purity mixed bed resin available. ResinTech MBD-ULTRA is designed for use in semiconductor, pharmaceutical, and power generation applications.

Sunday Hours: 5:00 p.m. - 11:00 p.m.

Monday Hours: 11:00 a.m. - 11:00 p.m.

Tuesday Hours: 11:00 a.m. - 11:00 p.m.

Wednesday Hours: 11:00 a.m. - 1:00 p.m.

ROHM AND HAAS COMPANY – ION EXCHANGE RESINS

State Room 1628, 16th Floor

Contact: Claire B. Murphy

5000 Richmond Street

Philadelphia, PA 19137

Tele: 215-537-4041

Fax: 215-537-4157

E-mail: mbhcmh@rohmhaas.com

Rohm and Haas Company manufactures a complete line of Ion Exchange Resins and adsorbents for the water treatment industry. Amberlite, Amberjet and Amberpack are Rohm and Haas trademarks.

Sunday Hours: 4:30 p.m. - 7:00 p.m. & 9:00 p.m. - 11:00 p.m.

Monday Hours: 4:30 p.m. - 7:00 p.m. & 9:00 p.m. - 11:00 p.m.

Tuesday Hours: 4:30 p.m. - 7:00 p.m. & 9:00 p.m. - 11:00 p.m.

ROHM AND HAAS WATER TREATMENT POLYMERS AND BIOCIDES

Shadyside Room, 1st Floor

Contact: Brian Holton, *Market Manager*
100 Independence Mall West
Philadelphia, PA 19106-2399
Tele: 800-223-3897
Fax: 610-437-5212

The Optidose traceable polymer system is a combination of traceable polymer and a "field friendly" test kit to detect that polymer. Optidose polymers offer equivalent performance to their Acumer counterpart, with the additional benefit of traceability.

Kathon® and Klarix™ biocides are used in cooling towers to preserve cooling water and prevent surfaces from biofouling and thus maintaining heat exchange efficiency.

Monday Hours: 11:30 a.m. - 1:30 p.m. & 4:30 p.m. - 7:30 p.m.
Tuesday Hours: 11:30 a.m. - 1:30 p.m. & 4:30 p.m. - 7:30 p.m.

SCIENTIFIC INSTRUMENTS

Conference Center D, Conference Level

Contact: Burt Sherry, *Manager, Sales*
200 Saw Mill River Road
Hawthorne, NY 10532
Tele: 800-431-1956
Fax: 914-769-5473
E-mail: bsherry@scientificinst.com

On-line monitors for measuring silica, sodium, phosphate, hydrazine and others in ultra-pure / process water for control purposes.

Monday Hours: 4:00 p.m. - 10:00 p.m.
Tuesday Hours: 2:00 p.m. - 10:00 p.m.

SENTRY EQUIPMENT

Room #1550, 15th Floor

Contact: Myron Feldman, *VP Domestic Sales*
Box 127
Oconomowoc, WI 53066
Tele: 414-567-7256
Fax: 414-567-4523
E-mail: myron@sentry-equip.com

Water and Steam Sampling Equipment

Monday Hours: 4:00 p.m. - 10:00 p.m.
Tuesday Hours: 12:00 p.m. - 10:00 p.m.

SWENSON PROCESS EQUIPMENT INC.

Room #636, 6th Floor

Contact: Lou LaPosa, *Director of Sales & Marketing*
15700 Lathrop Avenue
Harvey, IL 60426-5152
Tele: 708-331-5500
Fax: 708-331-5559
E-mail: Llaposa@Swenson-equip.com

Swenson engineering expertise is known throughout the world in the areas of evaporation, crystallization and drying. Our wastewater treatment systems include brine concentrators, mixed salt crystallizers, spray dryers, and valuable salt recovery systems. Services include engineering design, equipment supply, skidded systems, and turnkey plants. Over 110 years of experience and dedication to quality ensures that we meet our commitments and guarantees.

Sunday Hours: 7:00 p.m. - 9:30 p.m.
Monday Hours: 10:30 a.m. - 9:30 p.m.
Tuesday Hours: 10:30 a.m. - 9:30 p.m.
Wednesday Hours: 10:30 a.m. - 12:00 noon

SYBRON CHEMICALS INC.

Parlor D, 17th Floor

Contact: Dwight T. Tamaki, *VP Sales & Marketing*
Birmingham Road
P.O. Box 66
Birmingham, NJ 08011
Tele: 800-678-0020
Fax: 609-894-8641
E-mail: dtamaki@sybronchemicals.com

U.S. manufacturer of cation, anion, mixed bed, softening, and selective ion exchange resins, biochemicals used for water and wastewater treatment. Industrial, commercial, and household markets are served by our local sales personnel.

Sunday Hours: 5:00 p.m. - 11:00 p.m.
Monday Hours: 7:00 a.m. - 11:00 p.m.
Tuesday Hours: 7:00 a.m. - Noon

THERMAX LIMITED

Room #646, 6th Floor

Contact: Atul Bhagwat
40440 Grand River Avenue
Novi, MI 48375
Tele: 248-474-3050
Fax: 248-474-5790

Thermax Ltd. manufactures and distributes wide variety of ion exchange resins for various water treatment and speciality applications.

Monday Hours: 5:00 p.m. - 8:30 p.m.
Tuesday Hours: 5:00 p.m. - 8:30 p.m.

THORNTON ASSOCIATES, INC.

Room #716, 7th Floor

Contact: David Gray, *Product Manager*
1432 Main Street
Waltham, MA 02451
Tele: 1-800-642-4418, 781-890-3399
Fax: 781-890-5507
E-mail: info@thorntoninc.com

Thornton Associates, Inc. is a developer and manufacturer of instrumentation and sensors for monitoring water quality. Power plant applications include cycle chemistry, cooling tower and boiler feed water, and water treatment systems, with measurements such as resistivity/conductivity, flow, pressure, pH, ORP, temperature, TDS, and TOC.

Sunday Hours: 8:00 p.m. - 11:00 p.m.
Monday Hours: 4:00 p.m. - 11:00 p.m.
Tuesday Hours: 4:00 p.m. - 11:00 p.m.

USFILTER

Sky Room, 17th Floor

Contact: Mary Ellen Tucker
30 Technology Drive
Warren, NJ 07059
Tele: 908-668-1700
Fax: 908-668-1393

USFilter, now part of Vivendi Water, is the leading global provider of commercial, industrial, municipal and residential water and wastewater treatment systems, products and services, as well as a leading provider of outsourced water services including the operation of water and wastewater treatment systems at customer sites.

Sunday Hours: 6:00 p.m. - 10:00 p.m.
Monday Hours: 8:00 a.m. - 10:00 p.m.
Tuesday Hours: 8:00 a.m. - 10:00 p.m.
Wednesday Hours: 8:00 a.m. - Noon

WATER & POWER TECHNOLOGIES, INC.

Room #1508, 15th Floor

Contact: John F. Netto, *President*
3740 West 1987 South
Salt Lake City, UT 84104
Tele: 801-974-5500
Fax: 801-973-9733
E-mail: jnetto@wpt.com

Manufacturer of custom-designed, skid-mounted and mobile water purification systems, including reverse osmosis, demineralization, electrodeionization, filtration, ultrafiltration, manganese-greens and filters, activated carbon filters, softeners, etc. WPT offers engineering services and outsourcing (water-by-the-gallon contracts).

Monday Hours: 6:00 p.m. - 10:00 p.m.
Tuesday Hours: 6:00 p.m. - 10:00 p.m.

ZELLWEGER ANALYTICS

Parkview West, Conference Level

Contact: Vickie Olson, *Business Development Specialist*

4331 Thurmond Tanner Road

Flowery Branch, GA 30542

Tele: 770-730-0944

Fax: 770-730-0962

E-mail: vgolson@aol.com

Zellweger Analytics manufactures a complete range of on-line water analyzers to detect and monitor impurities. A leader in water analysis technologies for the power, pharmaceutical, and beverage industries measuring Sodium, Hydrazine, Dissolved Oxygen, Silica, Phosphate, Total Organic Carbon, Alkalinity, pH, Conductivity, Chlorine, Ozone, Turbidity and Suspended Solids.

Monday Hours: 1:00 p.m. - 10:00 p.m.

Tuesday Hours: 1:00 p.m. - 10:00 p.m.