

The Executive Committee, Advisory Council Companies and the Engineers' Society of Western Pennsylvania are proud to welcome you to Pittsburgh and the 58th Annual International Water Conference!

The IWC provides an excellent forum for experts in the field to debate and exchange viewpoints. Twenty-one sessions will be offered this year, ranging from the traditional offerings of ion exchange, membrane systems, boiler water, cooling water and wastewater treatment to the newer topics of business practices and engineering software. More than ever before, the Technical Sessions will emphasize panel discussions and attendee interaction. The 78 papers being presented represent state-of-the-art approaches to today's real-world issues while the four training workshops bring attendees to the cutting edge of current technology. The Luncheon programs (on Monday and Tuesday) provide open forums for discussion and problem-solving. Expect to see more debate, more controversy and more ideas than at any other IWC!


Following the traditional ringing of the IWC Bell on Monday morning, there will be 3 award presentations. The Joseph A. Levendusky Scholarship, sponsored by Epicor, Inc., is presented to aid in the education of a college student, or students, working toward a career in the water treatment field. The Paul Cohen Award, for an exceptional paper from the 1996 Conference, and the IWC Award of Merit, for outstanding service to the Conference, are presented by the Executive Committee.

The availability of leading suppliers at company-sponsored Info/Share Suites provides access to the full spectrum of technical and business information, as well as unrivaled networking opportunities. Don't miss your opportunity to meet these companies during their open hours on Sunday, Monday or Tuesday evenings.

Unfortunately, the past year has seen the loss of two leaders in the water treatment industry – Jesse Beecher and Fred Wilkes. Mr. Beecher served as a member of the Executive Committee of the IWC for 10 years and participated in the Conference for many more years. Mr. Wilkes also was a long-term IWC supporter, presenting numerous papers and prepared discussions, in addition to serving as Session Chair. They will be sorely missed and we dedicate this year's Conference to their memory.

The Conference is superbly supported by an Advisory Council of more than 50 leading companies in water treatment services, OEMs, engineering, consulting and chemical supplies. They provide not only financial support but also contribute the time of some of their best personnel to aid the Conference by organizing special sessions, writing papers and offering continuing guidance and input. The Conference would not be the same without their support, and we heartily thank them.

The International Water Conference is a unique environment in which to learn, debate, network and advance your understanding of, and your career in, the water industry. Welcome to the 58th Annual IWC!



John Schubert
General Chair

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

John Schubert, <i>General Chair</i>	Modular Environmental Technologies, Inc.
Andrew S. Calderwood	Westinghouse Corporation
Malcolm M. Clemens	Consultant
Kathleen Lagnese	Aristech Corporation
Joseph Loftis	Ionics Corporation
Edward F. Maziarz	Alcoa
David W. McFayden	CH2M Hill
Paul O'Boyle, <i>Vice Chairman</i>	Chester Engineers
Fred D. Potthoff	Kroff Chemical Company
David E. Simon II	Cyrus Rice Water Consultants
Alan Smith, <i>Program Chairman</i>	Calgon Corporation
Walter Zabban	Chester Environmental

INTERNATIONAL ATTENDEES WELCOME

This year, as always, one of IWC's top priorities is making sure that our international guests receive the very warmest welcome possible. We have made available the Allegheny Room for our guests to meet and greet each other, to compare notes and share experiences. Also, as in past years', we will have a "Goodwill Ambassador" from the Greater Pittsburgh Convention and Visitors Bureau available on the 17th Floor to assist with any questions or needs. The hours of operation in the Allegheny Room are: Sunday – 5:00 pm to 9:00 pm, Monday – 5:00 pm to 9:00 pm, and Tuesday – 10:00 am to 5:00 pm.

HYDROSOFT 97

The International Water Conference is proud to present HYDROSOFT 97, the 11th annual demonstration of computer applications in the industrial water treatment field. This hands-on program gives users the opportunity to review state-of-the-art software for water technology. Personal computer technology is an integral part of the way we conduct business in the water treatment community and HYDROSOFT 97 showcases the finest programs available, including ultrapure water and wastewater. All programs demonstrated at HYDROSOFT 97 are for sale for the use with purchase of the company's water treatment chemicals. A reference guide will be provided which lists all of the software packages on display and provides information on each participating company.

Don't miss HYDROSOFT 97, on display each day on the 17th floor. It is the most comprehensive presentation of software packages available to the industry and it's all waiting for you at the 1997 IWC.

Major league sports, top-notch dining, world-class musical and theater entertainment, and a thriving art scene that includes the famous Carnegie Museum and the Andy Warhol Museum are just a few of the attractions that await you in Pittsburgh. Take the incline up the side of Mt. Washington to get a spectacular view of the Pittsburgh skyline or visit Station Square, a 43-acre shopping complex with after dinner entertainment including a comedy club, sports bar, piano bar, dance club and dozens of specialty shops. Whether you're in for a quiet walk along the waterfront or an evening of jazz, Pittsburgh has it waiting for you. Talk to the "Goodwill Ambassador" from the Convention and Visitors' Bureau for more information — located next to the Registration Desk.

1997 INTERNATIONAL WATER CONFERENCE

Tennis Outing	Sunday
Get-Acquainted Mixer	Sunday Evening
Fellowship Reception	Monday Evening
Technical Sessions	Monday, Tuesday & Wednesday
Workshops/Training	Wednesday & Thursday
Refreshment Breaks	Midmorning/Midafternoon
Networking Opportunities	Nonstop

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 fourth year.

Time: Tuesday morning, November 4, 1997 at 6:45 a.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

SPOUSES' PROGRAM

Don't spend your day in the hotel room while your spouse or friends are attending meetings. Take advantage of our Spouses/Guests programs, which offers three exciting packages that span the three-day Conference: The Pittsburgh Brew Pub Tour, Pittsburgh City Tour, and Fallingwater Tour. Stop by the Registration Desk to sign-up for any or all of these programs. These events are open to all spouses and friends of IWC registrants visiting Pittsburgh for the IWC. Sunday it's the Pittsburgh Brew Pub Tour. Monday it's the Pittsburgh City Tour. Tuesday it's the Fallingwater Luncheon Tour. Join this wonderful group of IWC regulars and newcomers for a terrific time! Stop at the registration desk for more information.

REGISTRATION DESK

The Registration Desk is located in the 17th Floor Coat Room. Hours of Operation are:

Sunday, November 2, 1997	6:00 pm to 8:30 pm
Monday, November 3, 1997	7:30 am to 5:00 pm
Tuesday, November 4, 1997	7:30 am to 5:00 pm
Wednesday, November 5, 1997	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. Our International visitors will wear special international badges.

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. - 5:00 p.m. Monday through Wednesday. The messages will be retained until the end of each day.

REGISTRATION LISTS

Registrations received prior to October 27, 1997 have been compiled in THE IWC REGISTRATION LIST. This popular service provides attendees with additional networking opportunities.

An Addendum will be available the morning of Wednesday, November 5, 1997. It will contain those attendees that registered after October 27th 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, November 5, 1997. 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 Booth 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) and ASME Handbooks. 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.

HOTEL INFORMATION

Westin Willam Penn Hotel	(412) 281-7100
DoubleTree Hotel	(412) 281-3700
Marriott City Center	(412) 471-4000
Pittsburgh Hilton & Towers	(412) 391-4600
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, November 2, 1997 6:00 p.m. - 10:00 p.m.
 Monday, November 3, 1997 7:00 a.m. - midnight
 Tuesday, November 4, 1997 7:00 a.m. - midnight
 Wednesday, November 5, 1997 7:00 a.m. - 2:00 p.m.

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 registration and advise us of any such requirements.

IWC ADVISORY COUNCIL

The International Water Conference is supported by the 48 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	Andrew S. Bleadon
AMBI-Design, Inc.	Shan Sundaram
Aquatech International Corporation	V.N. Sharma
Ashland Chemical Company/ Drew Industrial Division	Doug Dewitt-Dick
Baker Industrial Chemicals	Mike Dalton
Bayer Corporation	M. Barry Robin
Bechtel	Kumar Sinha
Betz Water Management Group	James O. Robinson
Black & Veatch	Charles H. Fritz
Buckman Laboratories, Inc.	Richard W. Lutey
Calgon Corporation	Dileep Thatte
Capital Controls Company	George Solymosi
Cegelec Automation	
Chem-Treat	Dave Beck
Chemisis, Inc.	Robert J. Cunningham
Cochrane Environmental Systems	William D. Runyan

Croll-Reynolds Engineering Company	J.J. Quinlan
Culligan USA	Young Lee
Diversey Water Technologies, Ltd.	Gary Caplan
Dow Chemical Company	Dan Rice
Dupont-Permasp Products	Dr. Irving Moch, Jr.
Ecolochem, Inc.	William S. Miller
Epicor Incorporated	Richard Hetherington
Fort Bend Services, Inc.	James C. Dromgoole
Glegg Water Conditioning Inc.	James W. Laraway
GraverWater	Craig Lockhart
Hungerford & Terry, Inc.	Kenneth Sayell
Hydrochem Industrial Services Inc.	Steve Barber
Infilco Degremont, Inc.	J.D. Darji
Ionics, Incorporated	Edward Geishecker
ITS	Jack Pratt
Johnson March Systems, Inc.	William J. Herbert, Sr.
Mechanical Equipment Company(MECO)	Steve Alexander
Mitco, Inc.	Martin R. Orban
Mitsubishi Chemical America Inc.	Alan D. Sharpe
MPW Industrial Services	Dale Campion
Nalco Chemical Company	Wayne Bernahl
Puckorius & Associates, Inc.	Paul Puckorius
The Purolite Company	Edward D. Nace
ResinTech	Michael C. Gottlieb
Rohm and Haas Company	Crosby B. Dickerson
Sargent & Lundy Engineers	Alroy F. Aschoff
Sentry Equipment Corporation	Michael D. Farrell
Sheppard T. Powell Associates	David Cline, Jr.
Sybron Chemicals, Inc.	F.X. McGarvey
U.S. Filter	Robert L. Bradley
Water & Power Technologies, Inc.	Lee H. Van Dam
Zinkan Enterprises, Inc.	Louis J. Koenig, Jr.

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 **James C. Dromgoole**, Fort Bend Services, Inc., Sugarland, Texas. J.C. "Jim" Dromgoole is President of Fort Bend Services, Inc., an international water and wastewater treatment corporation and President of Chemical Services & Laboratories, Inc., a complete water, resin and deposit analysis laboratory.

He holds an Associate of Science Degree from San Antonio College, 1958, and holds a Bachelor of Science Degree, Chemical Engineering from the University of Texas at Austin, 1961.

He has authored and published numerous technical papers which have been presented in North America and have been published in Europe.

Mr. Dromgoole's memberships include the AIChE, NACE, Who's Who in Engineering, Federal Pollution Control Federation, Business Week Advisory Board, AWWA, Chemical Engineering Research Panel and International Water Conference Board.

SHIP

The fifteenth Joseph A. Levendusky Memorial Scholarship will be presented at the Opening Ceremonies of the International Water Conference. Co-recipients of the 1997 Scholarship are **Chad A. Hales**, a student at Michigan State University, and **Nichole E. Evans**, a student at the University of Michigan.

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.

IWC OPENING CEREMONIES

- 7:30 a.m. Registration booth opens, 17th floor
- 9:00a.m. Opening of Conference, Grand Ballroom, 17th floor, John Schubert, General Chairman, International Water Conference, Bernard Fedak, President, Engineers' Society of Western Pennsylvania.

Presentation of Annual Merit Award to James C. Dromgoole.

Presentation of Joseph A. Levendusky Scholarships to Chad A. Hales and Nichole E. Evans.

Presentation of Paul Cohen Award to Jan Stodola, Ontario Hydro, Ontario, Canada and Dr. Peter Tremaine, Memorial University of Newfoundland, St. John's, Newfoundland.

9:40am Coffee Break – Sponsored by Ionics, Incorporated

**SESSION A
ION EXCHANGE TOPICS PART 1****Grand Ballroom, 17th floor**

Session Chair: Ed Nace, Purolite Company, Bala Cynwyd, PA

IWC Representative: Andrew Calderwood,
Westinghouse Corporation, Madison, PA

Discussion Leader: Harold Aronvitch, Hungerford &
Terry, Clinton, NJ

**10:00am Multrex Ion Exchange System: How to Produce
17 MegOHM Water Without Mixed Bed**

Author: Nicolai Arion - *Arionex Water Treatment, Reinach,
Switzerland*

Co-author: Guy Mommaerts - *Purolite Canada*

IWC-97-01 Progress Report

Multrex is an upflow operated packed bed train utilizing at least one cation compartment, one or two anion compartments and a polishing cation. Due to the highly regenerated cation polisher, 17 megOHM water can be produced even from high salinity water. It is a very simple system to operate and highly efficient.

10:20am Floor Discussion

**10:30am A Comparison of Type II and Type III Strong Base
Anion Exchange Resins at the New Plymouth
Station, New Zealand**

Author: Terrance Heller - *The Purolite Company, Bala
Cynwyd, PA*

IWC-97-60 Paper

This paper is the final chapter in the discussion of a new type of anion exchange resin, Type III SBA. The Type III product (Purolite A 555) was found to have improved thermal stability versus conventional SBA II's, silica removal that approached SBA I's and regeneration efficiency very similar to that of a Type II resin. This paper will present field data gathered at New Zealand's New Plymouth Power Station from mid-'94 through mid-'97. Plant results on operating capacity, product life, silica leakage, conductivity, expansion during regeneration, pressure drop and resistance to organic fouling will be presented. Performance issues such as increased throughput, improved regeneration efficiency, decreased resin expenditures, reduced chemical consumption and a lower ionic loading to the mixed beds will also be quantified in this report.

10:55am Prepared Discussion:

Peter Yarnell - *Graver Chemical, Glasgow, DE*

11:05am Closure & Floor Discussion

11:20am Pros & Cons of Various Counter-Current Technologies

Author: John Farrar - *Dewplan Ltd., High Wycombe, UK*

IWC-97-03 Paper

Since the 1960s there have been many papers presented at the International Water Conference on counter-current regeneration techniques and the authors have contributed to several of them. Every OEM and resin manufacturer has felt it necessary to have at least one process which they can claim as their own, and unsurprisingly, this one process is better in every regard than everyone else's process. In this paper we will seek to show that in many cases the claimed differences between processes owe more to the PR man than to science, but we will also seek to show that some processes have their own advantages and disadvantages, particularly when related to the physical condition of the water to be treated rather than its chemical analysis.

11:45am Prepared Discussion:

Charles Fritz - *Black & Veatch, Kansas City, MO*

11:55am Closure & Floor Discussion

**SESSION B:
ECONOMIC ISSUES IN ADVANCED WATER
PURIFICATION**

Urban Room, 17th floor

Session Chair: Shan Sundaram, AMBI-Design, Rockford, IL

IWC Representative: Joseph Loftis, Ionics Incorporated, Bridgeville, PA

Discussion Leader: Bill Miller, Ecolochem, Norfolk, VA

10:00am Economic Crossover TDS Values for International Locations (Other than NAFTA Region) in Choosing R/O Systems Over Counter-Current Regenerated Ion Exchange Systems

Author: Shan S. Sundaram - *AMBI-Design, Inc., Rockford, IL*

IWC-97-04 Paper

Existing ion exchange systems as well as new water demineralizer projects are compared with reverse osmosis systems in terms of equipment and operating costs. When the RO systems are more economical in terms of lower operating cost and longer service runs, utilities and industries tend to replace IX systems with RO systems. The operating cost of IX systems also have been reduced drastically by lower chemical consumption, reduced rinse water requirements and lower resin prices.

This paper will evaluate the economic crossover TDS values (ECTVs) for different international locations above which RO systems will be more economical to operate than IX systems.

10:25am Prepared Discussion:
John Ungar - *Mitsubisbi Chemical, Arlington, VT*

10:35am Closure & Floor Discussion

10:50am Economic Impact of Water Treatment Outsourcing

Author: C. Richard Istre - *Ecolochem, Inc., Norfolk, VA*

Co-authors: William R. Temple, CPA - *Ecolochem, Inc., Norfolk, VA*; Edwin (Ed) R. Fertig, Gary Frost - *St. Laurent Paper Products Corporation, West Point, VA*

IWC-97-05 Paper

Today's pure water market is growing, prompted by many factors including cost of production, environmental regulations, manning concerns as well as others. Besides the decision to install new equipment or technology, the decision to install the equipment under a conventional purchase or to have an outside company provide the service is one that many will consider. Factors that will drive this financial decision are the availability of capital, technology risk assessment, net present value of money, internal rate of return, core competency spending, etc. In making this decision to use outsourcing, each must be considered in order to develop the most successful project.

11:10am Prepared Discussion:
Terry Laterra - *Graver Water, Cranford, NJ*

11:20am Closure & Floor Discussion

11:35am Economics of Long Term Leasing of Membrane-Based Water Make-Up System

Author: John C. Kiernan - *Ionics, Incorporated, Watertown, MA*

IWC-97-06 Paper

Several contracts under long term lease will be compared with the economics of capital purchases. Competitive capital system bid pricing will be compared to lease costs for membrane based boiler feed water make-up systems. Analysis will focus on the variances between equipment specified in the bid and that installed under long-term lease contracts; and the effect on operational and maintenance costs, as well as show that an optimum lease period exists, where longer terms do not reflect a savings to the plant. Common commercial terms and site responsibilities shall be discussed.

12:00pm Prepared Discussion:
Greg Bartley - *TVA, Chattanooga, TN*

12:10pm Closure & Floor Discussion

**SESSION C
WASTEWATER RECLAMATION/RECYCLING
PART 1****William Penn Room, Lower Lobby**

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

IWC Representative: Edward Maziarz, Alcoa, Pittsburgh, PA

Discussion Leader: Robert Bradley, U.S. Filter, Conroe, TX

10:00 am Beneficial Reuse of Wastewater Treatment Plant Effluent as Cooling Tower Makeup Water

Author: Clifford S. Wilkinson, P.E. - *Paulus, Sokolowski, and Sartor, Inc., Warren, NJ*

IWC-97-12 Paper

A system was designed to convey and treat wastewater treatment plant effluent for use as cooling tower makeup water at a power generating station. Before the project, the generating station withdrew 576 million gallons per day of water from an adjacent river and circulated it once through its cooling system.

10:25 am Prepared Discussion:

David Beck - *ChemTreat, Inc., Richmond, VA*

10:35 am Closure & Floor Discussion

10:50 am Development and Performance of a Biological Waste Water Treatment Plant for Cooling Water Systems in AHMSA Steel Works

Author: Ing. Victor Martínez Morales - *Altos Hornos de México S.A. DE C.V., Monclova, Coahuila, Mexico*

IWC-97-11 Progress Report

The use of the waste water streams (municipal and industrial) for treatment and re-use in several applications, had been growing strongly for the last few years in Mexico, because the private industries and the government are taking care of the natural resources. The construction of this Biological Waste Water Treatment Plant is based in the most recent water treatment techniques, and we expect to supply the best water quality to our Reverse Osmosis and demineralizer equipment mainly used for steam production, and also, to ion exchange equipment.

11:10 am Floor Discussion

11:20 am Water Reuse for Textile Industry

Author: Dr. Luciano Coccagna - *Culligan Italiana S.P.A., Bologna, Italy*

IWC-97-10 Paper

After the biological treatment of blended sewage and textile industry wastewater, the effluent is still heavily colored and unsuitable for any reuse. Through a direct filtration process the color is almost completely removed together with other objectionable pollutants thus achieving the compliance with the stringent specs of the textile industry in Italy for allowing the recycling of the water.

11:45am Prepared Discussion: to be announced.

11:55am Closure & Floor Discussion

SESSION D BOILER WATER CHEMISTRY

Monongahela Room, 17th floor

Session Chair: Douglas Dewitt-Dick, Ashland Chemical Co., Drew Industrial Division., Portland, TX

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

10:00am Sixteen Year Experience with Oxygenated Boiler Water Treatment in Korea

Author: Kwang-Kyu Park - *Korea Electric Power Research Institute, Taejon, Korea*

Co-authors: Do-Yeong Weon, Jeon-Soo Moon - *Korea Electric Power Research Institute, Taejon, Korea*

Presented by: Ronnie Pate - *Southern Company Services, Atlanta, GA*

IWC-97-08 Progress Report

Ulsan thermal power station units 4, 5 and 6 of Korea Electric Power Corporation (KEPCO) were converted from All Volatile Treatment (AVT) to Oxygenated Treatment (OT) in 1980. They have operated with OT for 16 years successfully.

10:20am Floor Discussion

10:30am Evaluation of Condensate Water Quality at a Thermal Power Plant by Using Process-Ion-Chromatographic Analyzer

Author: Toshio Sakurada - *Kyushu Electric Power Co., Inc., Tokyo, Japan*

Co-author: Junichi Igarashi - *Organo Co., Inc., Tokyo, Japan*

IWC-97-07 Progress Report

We succeeded recently in developing a process-ion-chromatographic analyzer (PIC). We installed the PIC in a fossil fuel power plant and measured continuously the

concentration of Na, Cl and SO₄ ions in the effluent of ammonium-form condensate polisher. (Organo's showersep system) By using PIC we could observe that concentration of each ion in the outlet of polisher was maximum at 0.1ppb during NH₄ form operation.

10:50am Floor Discussion

11:00am Development of High Performance Resin for BWR's Condensate Demineralizers

Author: Sakae Kosanda - *Ebara Corporation, Kanagawa-ken, Japan*

Co-authors: Tatsuya Deguchi, Akira Matsumoto, Takeshi Izumi, Masahiro Hagiwara, Takao Ino - *Ebara Corporation*; Katsuji Maeda, Ichiro Inami - *Toshiba Corporation*; Takuya Sakamoto, Akihiko Fujimori - *Tokyo Electric Power Company*; Hideki Takiguchi, Taku Ohira - *The Japan Atomic Power Company*; James R. Stahlbush - *The Dow Chemical Company*

IWC-97-09 Progress Report

We have further improved crud removal resin for condensate demineralizer in BWR in terms of organic leaching characteristics. The high performance resin, as a result, releases much less organic leachables and removes crud efficiently from condensate. The resin will be applied to one vessel in an actual BWR plant.

11:30am Floor Discussion

12:15 pm Water-Related Business Topics Luncheon Paneled/Oval Room

The Caterpillar Inc. Engine Production Facility of Mossville, IL has adopted a utilities outsourcing approach which is working well for them. During today's luncheon, Mr. John Thalhauser of Wheelabrator Environmental Systems who manages the Caterpillar program, will describe how outsourcing works, and the benefits to Caterpillar.

Pre-registration is required. Please inquire at the Registration Desk on the 17th floor.

SESSION A COUNTER-CURRENT ION EXCHANGE TECHNOLOGIES

Grand Ballroom, 17th floor

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

**IWC Representative: Andrew Calderwood,
Westinghouse Corporation, Madison, PA**

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

2:00pm Suspended Solids Removal for Counter-Current Systems

Author: Daniel B. Rice - *The Dow Chemical Company, Midland, MI*

IWC-97-13 Paper

The superior performance of counter-currently regenerated ion exchange systems versus conventional co-currently regenerated systems is widely understood and accepted. However, the superior performance requires that the ionic stratification of the resin bed not be disturbed during regeneration. Since the backwash step disrupts ionic stratification, suspended solids removal in counter-current operations requires a different approach than used for conventional systems. This paper will focus on the mechanisms that enable an UPCORE system (upflow regeneration packed bed) to operate without requiring a conventional backwash step. The suspended solids removal is accomplished during the regeneration process enabling the process to be run continuously without a specific backwash step. Operating performance on several North American plants using UPCORE systems for make-up demineralization will also be presented.

2:25pm Prepared Discussion:

Charles Fritz - *Black & Veatch, Kansas City, MO*

2:35pm Closure & Floor Discussion

2:50pm Successful Experience in Amberpack™ Packed Beds

Author: Amy H. Lettofsky - *Robm and Haas Company, Philadelphia, PA*

Co-author: Amin Kiami - *Robm and Haas Company, Philadelphia, PA*

IWC-97-14 Paper

The use of Reverse Flow Packed Bed (RFPB) technology has been increasing in recent years relative to the use of traditional co-flow systems in North America. This paper will discuss the performance advantages of Amberpack™ Reverse Flow Packed Bed technology and present several actual Amberpack operational experiences. An assortment of applications including demineralization and softening applications will be reviewed.

3:15pm Prepared Discussion:

George Crits - *Aqua-Zeolite Sciences, Inc.*

3:25pm Closure & Floor Discussion

3:35pm Coffee Break – Sponsored by Bayer Corporation**3:50pm Key Components in the Economics of Upflow "Packed Bed" Demineralizers**

Author: Philip W. Fatula - *Bayer Corporation, Pittsburgh, PA*

IWC-97-15 Paper

So-called "Packed Bed" systems significantly improve the operating costs of ion exchange-based demineralizations. In order to realize these savings, "non-traditional" approaches must be taken when one considers regenerants, resin selection, and cycle time. This paper reviews these "non-traditional" approaches and presents specific examples of their economic benefit.

4:15pm Prepared Discussion:
Dr. Sallie Fisher - Puricons, Inc., Malvern, PA

4:25pm Closure & Floor Discussion

4:40pm A Comparison of Three Different Counterflow Regeneration Systems in a 2800 gpm Water Plant

Author: Christian Beltle - *L. & C. Steinmüller GmbH, Gummersbach, Germany*

Co-author: G. Lisson - *InfraServe GmbH & Co., Weisbaden KG Energieversorgung, Germany*

IWC-97-16 Paper

Kalle Utility Works supplies 2800 gpm (640 m³/h) of high quality boiler feed water and process water to various local Hoechst manufacturing sites. The demineralized water is produced from the pre-treated Rhine river through eight counter-current demineralization lines of 350 gpm (80 m³/h) each. The systems in operation are three lines with POLSTER LUFT air hold down systems, three lines with SCHWEBEBETT upflow service fluidised packed bed systems and two lines with UPCORE down flow service packed bed systems. The latter are new and retrofitted vessels from earlier co-flow systems. The paper describes the plant overview comparing the main system characteristics showing lay-outs, operational data and performance data which have been monitored over the last 10 years.

5:05pm Prepared Discussion:
Harold Aronvitch - Hungerford & Terry, Clinton, NJ

5:15pm Closure & Floor Discussion

**SESSION B
MODERN BUSINESS TRENDS**

Urban Room, 17th floor

Session Chair: Robert J. Cunningham, Chemisis, Inc., Mission Viejo, CA

IWC Representative: Paul O'Boyle, Chester Engineers, Pittsburgh, PA

2:00pm Specifications for Contracted Water Treatment Service Programs

Author: David E. Simon II - *Cyrus Rice Water Consultants, Pittsburgh, PA*

IWC-97-17 Paper

This presentation offers a three-step methodology for preparing an unambiguous and comprehensive bid specification to obtain the best water treatment service program from a list of qualified vendors. Such a document should contain at least 10 major sections, the most important of which details the objectives of the program, including performance checks and targets. The paper also suggests a procedure for unbiased technical evaluation of the bid responses.

2:25pm Prepared Discussion:
Carson M. Barry - *Westvaco, Luke, MD*

2:35pm Closure & Floor Discussion

2:50pm Wastewater Outsourcing in Today's Industry

Author: Richard Bartkowski - *U.S. Filter, Pittsburgh, PA*

IWC-97-19 Progress Report

Outsourcing of non-core services is increasing in today's industry. Engineering and Construction Management have been outsourced for years. Utilities such as co-generation projects and industrial gases have also been regularly outsourced. As companies continue to focus on core business, many other support activities traditionally performed internally are now being provided on a service basis. Outsourcing of water and wastewater operations and maintenance is steadily increasing and is forecasted to increase well into the future. This paper will cover four (4) types of outsourcing projects currently underway. A discussion of each project with respect to technology applied, operational cost savings and value added will be presented. The BOOT concept is used in various methods on each project. The benefits of BOOT and contract operations will also be presented.

3:10pm Floor Discussion

3:20pm Coffee Break – Sponsored by Bayer Corporation

3:35pm Strategic Alliances in the Industrial Water Treatment Market: Who's Winning?

Author: Brent W. Chettle - *Water & Energy Systems Technology, Inc., Anaheim, CA*

IWC-97-18 Paper

This paper examines alliances between users and suppliers of industrial water treatment programs. These are also known as sole source agreements; an outgrowth of changed management philosophies based originally on W. Edwards Deming's principles of Quality Management. The author discusses some of the theoretical benefits associated with Alliances, but why, in this industry, most of these benefits are rarely seen.

4:00pm Panel Discussion: Strategic Alliances in the Industrial Water Treatment Market

Moderator: Robert J. Cunningham - *Chemisis, Inc.*

Panelists: Arthur J. Freedman, Ph.D. - *Arthur J. Freedman & Associates, East Stroudsburg, PA*; Paul R. Puckorius - *Puckorius & Associates, Inc., Evergreen, CO*; Brent W. Chettle - *Water & Energy Systems Technology, Anaheim, CA*; Fred Ienna - *Texaco Refining & Marketing, Inc., Anacortes, WA*; James L. Wertz - *Calpine, Gilroy, CA*; James Thibodeaux - *Nalco Chemical Company, Naperville, IL*

**SESSION C
WASTEWATER RECLAMATION/RECYCLING
PART 2**

William Penn Room, Lower Lobby

Session Chair: Robert Bradley, U.S. Filter, Conroe, TX

IWC Representative: Edward Maziarz, Alcoa, Pittsburgh, PA

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

2:00pm Recovery of Reverse Osmosis Brine at GM de Mexico Ramos Arizpe Complex

Author: Lawrence V. Krzesowski, P.E. - *General Motors North America Operation Facilities, Detroit, MI*

Co-authors: Roberto Camp, Arnulfo Berlanga - *GM de Mexico*; Gloria T. de Garza - *General Motors Consultant*; Shawn Tornton - *U.S. Filter/HPD*

IWC-97-23 Paper

The well water for the site is high in total dissolved solids and hardness. Due to concerns over calcium and barium sulfate scaling, recovery for the first stage reverse osmosis system is limited to 67%. With incorporation of Microfiltration Softening as pretreatment for a second stage RO, overall recovery can be increased to 97%.

2:25pm Prepared Discussion:
Kumar Sinha - *Bechtel Power Corporation, Gaithersburg, MD*

2:35pm Closure & Floor Discussion

2:50pm Waste Minimization and Reduction of Consumption of Natural Resources at a German Fertilizer Plant

Author: Dr. Wolfgang Hater - *Henkel Surface Technologies, Düsseldorf, Germany*

Co-author: Dr. Thomas Schmitz - *Hydro Agri, Brunsbüttel, Germany*

IWC-97-21 Paper

At a German fertilizer plant the optimization of cooling and process water treatment provided marked cost savings due to the reduction of water and chemicals consumption as well as a reduction of wastes. Basis of the success was a close cooperation between the responsible people of the plant and the supplier of chemicals.

3:15pm Prepared Discussion:
Denny Shea - *Solutia Inc., Alvin, TX*

3:25pm Closure & Floor Discussion

3:35pm Coffee Break – Sponsored by Bayer Corporation**3:50pm Microfiltration of Title 22 Water with Ceramic Membranes as Pretreatment to Reverse Osmosis**

Author: Linda Della Corna - *U.S. Filter Corporation, Warrendale, PA*

Co-author: James L. Filson - *U.S. Filter Corporation*

IWC-97-20 Paper

Sewage treatment plant effluent is increasingly being considered as a source for higher purity water applications, which generally require reverse osmosis treatment. But current RO pre-treatment methods are not always efficient. Preliminary tests show that ceramic membrane microfiltration can be effective for treating this water prior to RO.

4:15pm Prepared Discussion:
Bill Bresnahan, Ph.D. - *Mobile Technology Company, Paulsboro, NJ*

4:25pm Closure & Floor Discussion

SESSION D INDUSTRIAL PLANT CONDENSATE TREATMENT AND MONITORING

Monongahela Room, 17th floor

Session Chair: James Robinson, Betz Dearborn, Horsham, PA

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

Discussion Leader: James Dromgoole, Fort Bend Services, Stafford, TX

2:00pm Industrial Plant Condensate Treatment, State-of-the-Art

Author: Paul Schmidt - *Cyrus Rice Water Consultants, Pittsburgh, PA*

Co-author: David E. Simon, II - *Cyrus Rice Water Consultants, Pittsburgh, PA*

IWC-97-24 Paper

Paper discusses pros and cons and economic impacts of dealcalization operations and evaluation of various neutralizing amines in terms of volatility, distribution ratio, basicity and thermal decomposition. Also discussed are filming amines and condensate polishing by cation exchange and magnetic filtration as well as practical considerations for treating and monitoring an extended complex steam/condensate system.

2:25 pm Prepared Discussion:
Robert Holloway - *Holloway Associates, Islington, Ontario, Canada*

2:35 pm Closure & Floor Discussion

2:50 pm Predict and Optimize Boiler Cycle pH Control Using Advanced Computer Simulation

Author: Gary Reggiani - *Betz Dearborn, Horsham, PA*

IWC-97-26 Paper

This paper evaluates a proprietary computer modeling tool and its use to assist in amine product formulation, product application and troubleshooting of boiler loop chemistry and pH control. The Condensate Modeling System (CMS) provides accurate system analysis, increases troubleshooting productivity, and improves treatment performance. At IWC 1989, the author described a unique empirical diagnostic tool for condensate treatment optimization. The CMS program represents an extension and significant advancement in the ability to model and improve chemistry throughout a boiler system. Several case histories are presented to demonstrate the flexibility of this modeling tool to accurately analyze chemistry throughout the boiler cycle (feedwater, boiler, steam and condensate) for most industrial and utility configurations.

3:15 pm Prepared Discussion:
Roger Light - *Union Carbide, Sugar Land, TX*

3:25 pm Closure & Floor Discussion

3:35 pm Coffee Break – Sponsored by Bayer Corporation

3:50 pm Operational Steam Condensate Corrosion Control of Reboilers and Process Reheaters

Author: Edward Beardwood - *Drew Chemical Limited, an affiliate of Ashland Chemical Company, Ajax, Ontario, Canada*

IWC-97-25 Paper

Carbon dioxide and oxygen induced corrosion control can be achieved chemically at a cost while under steady state operational conditions. The majority of chronic corrosion concerns associated with steam condensate

handling and utilization systems are either mechanically assisted or mechanically chemically assisted under non steady state conditions. It has become apparent that corrosion product monitoring, system surveying and metallurgical failure analysis are of greater importance than chemical monitoring as the majority of the corrosion is mechanically induced. The interactive variables which lead to atypical post boiler depreciation and mitigation methods thereof will be discussed.

4:15pm Prepared Discussion:
James W. Smith - *Shell Oil Products, Houston, TX*

4:25pm Closure & Floor Discussion

4:40pm Regulatory Issues in Condensate Treatment

Author: Daniel Cicero - *Nalco Chemical Company, Naperville, IL*

IWC-97-27 Paper

Long recognized as effective tools for controlling steam condensate system corrosion, neutralizing and filming amines are coming under increasing scrutiny by utility managers. Changes in the regulatory environment, new requirements for VOC and vapor pressure reporting and increasing pressure to manage risks encourage a thorough understanding of the issues involved. What are the regulations impacting the use of amines in an industrial setting? How do the requirements of the FDA, USDA, OSHA and other agencies affect decisions about the use and control of amines? What are the potential risks associated with the use of these products? Are there strategies for minimizing or eliminating risks? The purpose of this paper is to examine the current regulatory arena, outline the challenges presented by it and offer some suggestions for effective, safe application and control of condensate system corrosion inhibitors.

5:05pm Prepared Discussion:
Carol Jones Ludwig - *Dow Alkanolamines TS & D, Freeport, TX*

5:15pm Closure & Floor Discussion

**6:30pm Good Fellowship Mixer – Sponsored by the
Advisory Council Companies
Entertainment Sponsored by Calgon Corporation**

**SESSION A
UPGRADING INDUSTRIAL WATER
TREATMENT SYSTEMS****Grand Ballroom, 17th floor****Session Chair: Young Lee, Culligan International, Northbrook, IL****IWC Representative: Malcolm Clemens, Consultant,
Pittsburgh, PA****Discussion Leader: Mary Kerr, Sargent & Lundy, Chicago, IL****8:30am Pretreatment System Upgrade in a Fossil Plant**

Author: Tom Pike - *Western Farmers Electric Cooperative, Ft. Towson, OK*

Co-author: Emery Lange - *Drew Industrial Division, Ashland Chemicals, Memphis, TN*

IWC-97-28 Paper

This paper investigates various problems utilities may encounter while trying to meet water quality standards. It describes the Hugo Power Plant's physical structure, clarification process, and potable water system. The paper concentrates on the causes of unacceptable water quality and steps taken to overcome these problems. The authors explain how drip feeding cationic polymer into the outer reaction zone of the secondary basin improved the overall quality of water.

8:55 am Prepared Discussion:
Al Aschoff - *Sargent & Lundy, Arlington Heights, IL*

9:05 am Closure & Floor Discussion

**9:20am RO Operating Cost Reduction Through
Pre-Treatment Improvement**

Author: Sergio Gherardi - *Culligan Italiana S.p.A., Bologna, Italy*

IWC-97-29 Paper

Correct water pre-treatment plays a fundamental role for keeping the efficiency of any R.O. systems. Through two case histories it is shown how excessive energy wasting and reduced performance of R.O. membranes were recovered after careful investigation and appropriate pre-treatment adjustment.

9:45 am Prepared Discussion:
Robert Allison - *Ionics, Watertown, MA*

9:55 am Closure & Floor Discussion

**10:10am Coffee Break – Sponsored by Buckman
Laboratories, Inc., Epicor, Incorporated,
Hungerford & Terry, Inc.**

10:30am Simultaneous Removal of Silica and Boron from Produced Water by Chemical Precipitation

Author: Joseph Drago - *Kennedy/Jenks Consultants, San Francisco, CA*

Co-authors: D.A. Fruth - *Kennedy/Jenks Consultants, San Francisco, CA*; G.F. Doran - *ARCO Western Energy, Bakersfield, CA*; L.Y.C. Leong - *Kennedy/Jenks Consultants, Irvine, CA*

IWC-97-31 Paper

This paper presents the results of bench-scale softening experiments conducted at warm temperatures (~150° F) to evaluate the removal of silica, boron, and hardness from oilfield produced water. Simultaneous removal of silica and boron was optimized at pH between 9.6 and 9.8.

10:55am Prepared Discussion:

Mary Kerr - *Sargent & Lundy, Chicago, IL*

11:05am Closure & Floor Discussion

11:20am Use of New Membranes – A Smart Way to Expand the System

Author: Krish Parthasarathy, P.E. - *Culligan Water Technologies, Inc., Northbrook, IL*

Co-author: Frank Varni - *Kagome, U.S.A, Los Banos, CA.*

IWC-97-30 Progress Report

Kagome, Inc. is one of the leading food and beverage processing companies in California. Recently, Kagome expanded their product lines, increasing their water requirements well beyond the capabilities of the existing water treatment system. With this expansion, space also became a premium. After investigating various options, 400 square feet high rejection membranes were selected. The RO units were retrofitted with new membranes and the capacity of each unit was increased to 70 GPM. The system was started on 1/20/96 and has been in service for the past 12 months. By employing this option, Kagome was able to increase their capacity to meet the high demand of the growing season, save precious space and expand in stages without affecting production.

11:45am Closure & Floor Discussion

**SESSION B
INNOVATIVE WASTEWATER PROCESSES****Monongahela Room, 17th floor**

Session Chair: Kashi Banerjee, Chester Engineers, Pittsburgh, PA

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

Discussion Leader: Joe Rabosky, Rabosky & Associates, Moon Township, PA

8:30 am UV/Oxidation Process Optimization for the Treatment of Hydrazine Wastewaters at the John F. Kennedy Space Center

Author: Daniel J. Tierney - *EG&G Florida, Inc., Kennedy Space Center, FL*

Co-author: George S. Kosar - *NASA, Kennedy Space Center, FL*

IWC-97-32 Progress Report

Space launch activities generate hazardous waste in the form of aqueous hydrazine wastewater. An Advanced Oxidation Process (AOP) technology utilizing ultraviolet light radiation has been implemented and optimized at the Kennedy Space Center for the treatment of refractory contaminants. This paper discusses the history and process enhancements particularly the use of iron-based catalysts illustrating that a treatment cost reduction of 90% is achievable.

8:50 am Floor Discussion

9:00 am Removal of Ammonia from Wastewater Using a Type of Natural Zeolite

Author: Hans D. Pflug - *Preussen Elektra AG, Hanover, Germany*

Co-authors: Martin B. Hein, Andreas Henkel, H.J. Bettenworth - *Preussen Elektra AG, Hanover, Germany*

IWC-97-34 Progress Report

The paper presents experimental studies on the loading and elution of Clinoptilolite to selectively remove ammonia from industrial waste water under various operational conditions. The recirculated eluate was regenerated by thermal stripping of ammonia. Also biological in situ nitrification on Clinoptilolite was tested.

9:20 am Floor Discussion

9:30 am COD Reduction in Effluent Arising from Treatment of Spent Cutting Fluids

Author: Mark Neville - *AEA Technology Inc., Didcot, Oxfordshire, U.K.*

Co-author: Nigel Blake - *AEA Technology, Didcot, Oxfordshire, U.K.*; Mark Isaacs - *AEA Technology, Pittsburgh, PA*

IWC-97-35 Paper

Reductions in the concentration of soluble organic species in machine-shop effluent can be made by using reverse osmosis. Work described in this paper charts the development of an effluent clean-up program from feasibility trials through to plant design for COD reduction. Several membranes were tested at laboratory scale to establish which might be suitable for the duty. A six-week pilot program was then undertaken at the end-user's site to validate and optimize the process. Rejection of COD was 99% with the membrane fluxes between 10 and 20 L/m².h, depending on feed concentration. Based on these data, a final flowsheet design suggests that for a feed at 2000 mg/L COD, a final discharge of about 20 mg/L could be achieved by a two-stage reverse osmosis plant.

9:55 am Prepared Discussion: to be announced.

10:05 am Closure & Floor Discussion

10:20 am Session Concludes

SESSION C

GENERAL COOLING WATER TOPICS

Urban Room, 17th floor

Session Chair: George Solymosi, *Capitol Controls Co., Colmar, PA*

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

Discussion Leader: Dileep Thatte, *Calgon Corporation, Pittsburgh, PA*

8:30 am **Toward Field-Friendly Traceable Polymeric Dispersants**

Author: William M. Hann - *Robm and Haas Company, Spring House, PA*

Co-authors: L.H. Keller, T.W. Sanders, B. Weinstein - *Robm and Haas Company, Spring House, PA*

IWC-97-36 Progress Report

We have developed non-hazardous detectable polymers for use as antiscalants/dispersants in cooling and boiler water applications. Laboratory and pilot studies are presented that document performance of these tagged polymers. The detection system, based on immunoassay techniques, is sensitive to less than about one ppm active polymer.

8:50 am Floor Discussion

9:00 am **Rust Cleaning at Moderate pH**

Author: Bruce L. Libutti - *Ashland Chemical Company Drew Divisions, Boonton, NJ*

Co-authors: Joseph Mihelic - *Ashland Chemical Company Drew Divisions, Boonton, NJ*; Richard J. Magnotta - *Ashland Chemical Company Drew Industrial Division, Camillus, NY*; Andrew Gimbar, Jr. - *Cornell University, Ithaca, NY*

IWC-97-37 Progress Report

Removal of old corrosion products is sometimes the first step in establishing an effective water treatment program. A cleaner has been developed which is effective at near-neutral pH, which allows the option of cleaning on line. Development and initial evaluations are described.

9:20 am Floor Discussion

9:30 am A New Environmentally Friendly Corrosion Inhibitor for Soft Water Fed Cooling Systems

Author: Brian K. Failon - *Albright & Wilson Americas, Inc., Glen Allen, VA*

Co-author: Brian L. Downward - *Albright & Wilson U.K. Ltd., Warley, West Midlands, U.K.*

IWC-97-38 Paper

A new all organic corrosion inhibitor (PCM) delivers exceptional corrosion inhibition in industrial cooling water systems using soft make up water; without the use of environmentally damaging heavy metals.

9:55 am Prepared Discussion:

Jim Haff - *Calgon Corporation, Pittsburgh, PA*

10:05 am Closure & Floor Discussion

10:15 am Coffee Break – Sponsored by Buckman Laboratories, Inc., Epicor, Incorporated, Hungerford & Terry, Inc.

10:30 am A New Corrosion Inhibitor Program (Molybdate/Zinc) Successfully Replaces Chromate/Zinc Under High Contamination Levels

Author: Wilton José Lo Giúdice - *Buckman Laboratórios Ltda, Campinas, S.P., Brazil*

Co-authors: S.F.D. Aranha - *Buckman Laboratórios Ltda, Campinas, S.P., Brazil*; M. Monaco - *Usina Santa Cruz - Ometto Paven Group Américo Brasiliense, S.P., Brazil*

IWC-97-39 Paper

A Molybdate/Zinc Program (10 ppm molybdate, plus 5 ppm of zinc) was tested in an Alcohol Distillery Cooling Tower under high contamination levels (such as sulfur and ferment). The performance of this new treatment was about 2,0 mpy. The previous treatment was Phosphate Stabilized

plus Zinc Program. This treatment failed due to the excessive microbiological growth, caused by the phosphate that worked as a nutrient. Cromate/zinc was the only one successful program until the environmental restrictions forbid that treatment.

10:55 am Prepared Discussion:

Michael E. Rogers - *Syncrude Canada Ltd., Canada*

11:05 am Closure & Floor Discussion

11:20 am Calcium Carbonate Scale Inhibitors: Can Stability Constants be Used as a Tool for Finding Improved Performance?

Author: Daniel Parker Vanderpool - *Laurel Functional Chemicals, Coraopolis, PA*

IWC-97-40 Paper

Scale inhibitor effectiveness has been shown to be related to adsorption of the inhibitor onto the crystal surface. Stability constants in solution for calcium complexes of organic phosphonates presumably parallel the adsorptivity of phosphonates for the surface of a calcium carbonate crystal and, for this reason, stability constants have been considered as a means of ranking scale inhibitors. However, the stability constant alone is meaningless. More informative for the understanding of relative inhibitor affinities for calcium is the distribution of species at a given pH and ionic composition. The explanation of how to use stability constants and the tabulation of the amounts of the major species at each pH could be of use in discerning trends that may lead to more effective selection of scale inhibitors.

11:45 am Prepared Discussion: to be announced.

11:55 am Closure & Floor Discussion

**SESSION D
MISCELLANEOUS BOILER TREATMENTS**

William Penn Room, Lower Lobby

Session Chair: Kevin Shields, Sheppard T. Powell Assoc., Baltimore, MD

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

Discussion Leader: Tony Banweg, Nalco Chemical Co., Naperville, IL

8:30 am Waterside Inspecting Techniques for Industrial Boilers

Author: Samuel B. Dilcer Jr. - *Cyrus Rice Water Consultants, Bradford Woods, PA*

Co-author: James C. Droomgoole - *Fort Bend Services, Inc., Stafford, TX*

IWC-97-41 Paper

Thorough boiler inspections are required to assess the ability of a boiler to operate without an unscheduled outage to the next inspection. Based upon past history and quality inspections, a number of plants are able to extend the typical 12 month inspection cycle to 24 months or more. The authors use their combined seventy-five years of experience in treating and inspecting boilers to review ways to make a thorough waterside inspection.

8:55 am Prepared Discussion:

Dennis Frey - *Dennis Frey Consultants, Canton, OH*

9:05 am Closure & Floor Discussion

9:20am A Real-Time, Continuous Method of Monitoring Corrosion Rates in Closed Steam Generating Cycles

Author: Brown T. Hagewood - *Long Island Lighting Company, Glenwood Landing, NY*

Co-author: Jeffrey J. Kost - *Long Island Lighting Company, Glenwood Landing, NY*

IWC-97-45 Paper

The corrosion rate in closed steam generating cycles can be determined by the hydrogen in the surface condenser exhausted air. The response time is rapid since the retention time of non-condensibles, including hydrogen, is very short. Injecting known quantities of hydrogen gas into the feedwater allows on-line calibration.

9:45 am Prepared Discussion: to be announced.

9:55 am Closure & Floor Discussion

10:10am Coffee Break – Sponsored by Buckman Laboratories, Inc., Epicor, Incorporated, Hungerford & Terry, Inc.

10:30am Experimental Study on Concentration of Corrosive Impurities in Steam Due to Early Condensation

Author: Hiroshi Yamauchi - *Hitachi Ltd., Japan*

Co-authors: Takayuki Mizuno, Shinichi Ueshimo - *Mie University*; Takashi Honda, Takeshi Onoda - *Hitachi, Ltd., Japan*

IWC-97-42 Paper

Concentration of corrosive impurities such as NaCl, NaOH and so on due to early condensation is one of the serious problems in power cycle chemistry. We have experimentally reproduced the early condensation and their concentration by expanding supercritical water adiabatically in a trumpet-type tube. The concentration ratio was about 2 orders.

10:55am Prepared Discussion:
Jim Bellows - *Westinghouse Electric Corporation,
Orlando, FL*

11:05am Closure & Floor Discussion

**11:20am Development and Testing of a Low-Hazard
Corrosion Inhibitor for Use in Organic Acid and
Chelant-Based Cleaning Solutions**

Author: Wayne W. Frenier - *HydroChem Industrial Ser-
vices, Houston, TX*

IWC-97-43 Progress Report

HydroChem R&D has developed a low-hazard corrosion inhibitor for use in organic acid and chelating agent cleaning formulations. This material does not contain formaldehyde, ethylene glycol derivatives or any known carcinogenic materials. Through the use of an innovative synthetic procedure, it also does not contain isopropyl alcohol. In laboratory tests, corrosion protection values were equivalent to or superior to those provided by current commercial organic acid inhibitors. Lab and field tests using the low-hazard inhibitor have been conducted in ammonium EDTA-based solvents and the results of these tests will be described.

11:40am Floor Discussion

**12:15pm Modernizing Your Existing Water
Demineralization System Luncheon
Paneled/Oval Room**

This luncheon is presented in a panel format, which features experts from a variety of backgrounds and disciplines, including ion exchange and reverse osmosis. This popular format offers a great opportunity to interact with others concerned with this subject and to ask the experts about all you demineralization problems.

**SESSION A
AUTOMATED SYSTEMS FOR CONTROL
AND MONITORING**

Monongahela Room, 17th floor

**Session Chair: Wayne Bernahl, Nalco Chemical Co.,
Naperville, IL**

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

**2:00pm Optimization of Chemical Treatment Programs
for the High Cycle Operation of Cooling Tower
Systems with Polluted Han-river Water**

Author: Jeon-Soo Moon - *Korea Electric Power Research
Institute, Taejon, Korea*

Co-authors: Kwang-Kyu Park, Do-Yeong Weon - *Korea Electric Power Research Institute, Taejon, Korea*

Presented by: Tony Selby - *Puckorius & Associates, Inc., Evergreen, CO*

IWC-97-46 Progress Report

Common chemical treatment programs have been developed from bench scale tests and field pilot tests for the high cycle operation of cooling tower systems at the KEPCO power plants. A new conceptual fouling monitor has been designed to measure the fouling resistance of heat transfer surface more accurately.

2:20pm Floor Discussion

2:30pm Fluorescent Traced Chemical Program – Not Just a Feed and Control Program, but a Problem-Solving Tool

Author: Michael J. Chmelovski - *Nalco Chemical Company, Naperville, IL*

IWC-97-47 Progress Report

In the early years of fluorescent traced chemical programs, the primary benefit was improved control to insure excellent results and optimum cost performance. The examples discussed demonstrate how these programs have evolved into more of a problem solving tool, as well as a control program.

2:50pm Floor Discussion

3:00pm Cation Conductivity Temperature Compensation

Author: David M. Gray - *Thornton Associates, Inc., Waltham, MA*

Co-author: Anthony C. Bevilacqua, Ph.D. - *Thornton Associates, Inc., Waltham, MA*

IWC-97-48 Progress Report

The importance of high purity water conductivity temperature compensation has been widely recognized. The high and variable temperature coefficients create a special challenge in obtaining accurate specific and cation conductivity measurements. Presented here is a background of temperature compensation in the power industry and a comparison with new developments.

3:20pm Floor Discussion

3:30pm Coffee Break – Sponsored by Capital Controls Co., Culligan International, Sybron Chemicals, Inc.

3:50pm A Novel Approach to Successful Cooling Water Monitoring

Author: Renee Jacobs - *Sasol Chemical Industries, Sasolburg, South Africa*

Co-author: Maryke Kruger - *Sasol Chemical Industries, Sasolburg, South Africa*

IWC-97-49 Progress Report

Effective cooling water monitoring and control incorporates the latest technological advances and makes use of practical, inexpensive, novel approaches to complement conventional methods. A comprehensive understanding of the system, effective communication between the relevant parties and integration of all available information is the cornerstone to any reliable monitoring methodology.

4:10pm Floor Discussion

4:20pm The Determination of Hardness in Pure and Industrial Waters Using the APA 6000 Hardness Process Analyzer

Author: C.H. Pollema - *Hach Company, Loveland, CO*

Co-author: S.F. Acevedo - *Hach Company, Loveland, CO*

IWC-97-50 Progress Report

This paper presents data overviewing performance of the APA 6000 hardness process analyzer. The analyzer uses a new technique based on sequential injection analysis (SIA). The discussion will cover the general capabilities of the analyzer as well as the basis of its operation. Initial field testing data will be presented.

4:40pm Floor Discussion

**SESSION B
MICROORGANISM CONTROL/MITIGATION
IN COOLING WATER SYSTEMS**

Allegheny Room, 17th floor

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

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

Discussion Leader: Martin Orban, Mitco, Inc., Grand Rapids, MI

2:00pm Use of a New Bromine-Based Biocide in a Medium-Sized Cooling Tower

Author: Robert M. Moore - *Albemarle Corporation, Baton Rouge, LA*

Co-authors: C.J. Nalepa, G.L. Golson - *Albemarle Corporation, Baton Rouge, LA*; T.W. Wolfe, P.R. Puckorius - *Puckorius & Associates, Evergreen, CO*

IWC-97-51 Paper

A new single-liquid-feed bromine-based biocide was shown to be effective in controlling microbiological growth in cooling tower water. The biocide was easy to dose and resulted in lower corrosion rates. These conclusions will be supported by chemical analysis, corrosion coupon and meter data and microbiological tests.

2:25pm Prepared Discussion:
Rod Sergent - *Chattem Chemical Company,
Chattanooga, TN*

2:35pm Closure & Floor Discussion

2:50pm Microbially-Influenced Corrosion of Stainless Steel Tubing: A Case History and a Brief Review

Author: Donald L. Gibbon - *Calgon Corporation, Pittsburgh, PA*

Co-author: Rodney M. Donlan - *Calgon Corporation, Pittsburgh, PA*

IWC-97-52 Progress Report

Anaerobic bacteria colonized stainless steel condenser tube surfaces, protected from biocides by deposits. Their metabolites corroded the steel, producing a major "cave" under the surface. Dramatic evidence for bacterial action is seen in unique micrometer-sized circular corrosion marks on the cave floor, showing crystallographic features and specialized surface chemistry.

3:10pm Floor Discussion

3:25pm Coffee Break – Sponsored by Capital Controls Co., Culligan International, Sybron Chemicals, Inc.

3:40pm Microbiologically Influenced Corrosion of Stainless Steels by Water Used for Cooling and Hydrostatic Testing

Author: Greg Kobrin - *Nickel Development Institute, Beaumont, TX*

Co-authors: Stephen Lamb - *Nickel Development Institute, Huntington, WV*; Arthur H. Tuthill - *Nickel Development Institute, Blacksburg, VA*; Richard E. Avery - *Nickel Development Institute, Londonderry, NH*; K. Anthony Selby - *Puckorius & Associates, Evergreen, CO*

IWC-97-53 Paper

Case histories from the authors' experiences highlight factors which caused microbiologically influenced corrosion (MIC) of stainless steel piping, tanks and heat exchangers by waters used for hydrotesting, cooling and other purposes. Practices which will prevent or reduce potential for MIC are discussed.

4:05pm Prepared Discussion:
Richard Lutey - *Buckman Laboratories, Memphis, TN*

4:15pm Closure & Floor Discussion

DATE & TIME	Grand Ballroom (17th Floor)	Urban Room (17th Floor)	William Penn Room (Lower Lobby)	Monongahela Room (17th Floor)	Allegheny Room (17th Floor)
MONDAY, NOV. 3, 1997					
Opening Session – 9:00am - 10:00am	Welcome Session				
Morning Session – 10:00am - 12:00pm	Ion Exchange Topics Part 1	Economic Issues in Advanced Water Purification	Wastewater Reclamation/ Recycling Part 1	Boiler Water Chemistry	
Lunch – 12:15pm - 2:00pm	Water-Related Business Topics Luncheon				
			Advance Ticket Purchase Required	Paneled/Oval Room	
Afternoon Session – 2:00pm - 5:00pm	Counter-Current Ion Exchange Technologies	Modern Business Trends	Wastewater Reclamation/ Recycling Part 2	Industrial Plant Condensate Treatment and Monitoring	
TUESDAY, NOV. 4, 1997					
Morning Session – 8:30am - 12:00pm	Upgrading Industrial Water Treatment Systems	General Cooling Water Topics	Misc. Boiler Treatments	Innovative Wastewater Processes	
Lunch – 12:15pm - 2:00pm	Modernizing Your Existing Water Demineralization System Luncheon				
			Advance Ticket Purchase Required	Paneled/Oval Room	
Afternoon Session – 2:00pm - 5:00pm	Ion Exchange Topics Part 2	Flow Accelerated Corrosion	Engineering Software Applications	Automated Systems for Control and Monitoring	Microorganism Control/ Mitigation in CW Systems

DATE & TIME	Grand Ballroom (17th Floor)	Urban Room (17th Floor)	William Penn Room (Lower Lobby)	Monongahela Room (17th Floor)	Allegheny Room (17th Floor)
WEDNESDAY, NOV. 5, 1997					
Morning Session – 8:00am - 12:00pm	Upgrading Demineralizer Performance	Non-Conventional Microbial Control Methods	Innovations in Membrane Systems	Implementing PWR Secondary Water Chemistry Guidelines	
TRAINING WORKSHOPS – Located in the Conference Center on the Club Level					
Pre-registration required for attendance					
WEDNESDAY, NOV. 5, 1997 1:00pm - 5:00pm	Industrial Boiler Water Treatment Programs – Introductory Course	Industrial Cooling Water Treatment Programs – Introductory Course	Design, Maintenance and Troubleshooting for Membrane Water Treatment Systems	Detection and Mitigation of Microbiologically Influenced Corrosion – Part One	
THURSDAY, NOV. 6, 1997 8:00am - 5:00pm	Industrial Boiler Water Treatment Programs – Advanced Course	Industrial Cooling Water Treatment Programs – Advanced Course	Design, Maintenance and Troubleshooting for Membrane Water Treatment Systems	Detection and Mitigation of Microbiologically Influenced Corrosion – Part Two	

**SESSION C
FLOW ACCELERATED CORROSION****Urban Room, 17th floor**

Session Chair: James Bellows, Westinghouse Electric, Orlando, FL

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

Discussion Leader: Frank Gabrielli, ABB Combustion Engineering, Windsor, CT

2:00 pm Flow-Assisted Corrosion - An Introduction

Author: Paul Burgmayer - *Betz Dearborn, Trevose, PA*

IWC-97-55 Paper

This paper provides an introduction to flow-assisted corrosion as well as the associated topics of liquid impingement and cavitation erosion. A short description of the fluid mechanics involved in these processes is also presented.

2:25 pm Control of Flow-Accelerated Corrosion in Fossil, Cogeneration and Industrial Steam Plants

Author: Douglas P. Munson - *Electric Power Research Institute, Palo Alto, CA*

Co-authors: Bindi Chexal, Barry Dooley - *Electric Power Research Institute, Palo Alto, CA*; Richard J. Tilley - *Electric Power Research Institute, Charlotte, NC*

IWC-97-57 Paper

Flow accelerated corrosion (FAC) is a serious threat to the structural integrity of piping and pressure vessels of fossil power and industrial steam plants. If not found in time, a severely damaged component can fail suddenly and with catastrophic results. New predictive technology, water chemistry guidelines, and a programmatic approach to detect and control FAC are presented.

2:50 pm Pathology of Single Phase Flow-Assisted Corrosion Failures in Industrial Boilers

Author: Torry Tvedt - *Puckorious & Associates*

Co-author: Harold Chagnard - *The Dow Chemical Co., Plaquemine, LA*

IWC-97-56 Paper

Waterside failures due to flow assisted corrosion are a significant problem in industrial boilers. Several case studies will be presented which illustrate this phenomenon. Methods for verifying the failure mode and factors, which significantly contributed to the failure, will be

discussed. Several models have been developed which attempt to correlate single-phase flow assisted corrosion to important parameters. These failures will be compared to corrosion rates, which were predicted by one of these models. This paper will discuss methods for evaluating a proposed boiler design for potential flow assisted corrosion problems and suggest methods for minimizing this form of corrosion.

3:15pm Coffee Break – Sponsored by Capital Controls Co., Culligan International, Sybron Chemicals, Inc.

3:30pm Moderated Open Floor Discussion

SESSION D ION EXCHANGE TOPICS PART 2

Grand Ballroom, 17th floor

Session Chair: Richard Hetherington, Epicor Incorporated, Linden, NJ

IWC Representative: David McFayden, CH2M Hill, Pittsburgh, PA

Discussion Leader: Dave P. Fetterman, PECO Co., Philadelphia, PA

2:00pm Problems of H₂O₂ Traces on Ion Exchange Resins in Ultrapure Water Production

Author: Dirk-Michael Pfenning - *Bayer AG, Leverkusen, Germany*

IWC-97-58 Paper

It is known from the literature that during UV irradiation of pure water ($180 < \lambda < 270$ nm) used for TOC reduction H₂O₂ is formed. This causes destruction of downstream placed ion exchange resins which can be prevented by using a Pd doped catalytic resin also reducing dissolved oxygen level.

2:25pm Prepared Discussion:
Sallie Fisher - *Puricons, Inc., Malvern, PA*

2:35pm Closure & Floor Discussion

2:45pm Selective Removals of Arsenate, Chromate and Phosphate Using a New Class of Anion Exchangers

Author: Arup K. SenGupta - *Lehigh University, Bethlehem, PA*

Co-author: Dongye Zhao - *Lehigh University, Bethlehem, PA*

IWC-97-59 Paper

Arsenate, chromate and phosphate in water and wastewater have significant environmental impacts, and are subject to stringent regulations. Conventional anion ex-

changers are ineffective to achieve selective removals of these trace contaminants mainly due to formidable competition from other common anions such as sulfate, nitrate, chloride, bicarbonate and dissolved organic matter (DOM). This paper reports a new class of anion exchangers, referred to as polymeric ligand exchangers (PLE), which exhibit unusually high affinity toward arsenate, chromate and phosphate. Also, the PLE can be regenerated efficiently using brine, and possibly reused for hundreds of cycles.

3:10pm Prepared Discussion:
Francis McGarvey - *Consultant, Cherry Hill, NJ*

3:20pm Closure & Floor Discussion

3:30pm Coffee Break – Sponsored by Capital Controls Co., Culligan International, Sybron Chemicals, Inc.

3:45pm Amoco Chemical Company Amberpack Retrofit Increases Production and Reduces Operating Cost

Author: Wendy N. Watson - *Amoco Chemical Company, Decatur, AL*

Co-authors: Frank C. Marinucci - *Amoco Chemical Company, Decatur, AL*; Amy H. Lettofsky - *Rohm and Haas Company, Philadelphia, PA*

IWC-97-61 Paper

Process water demand from the Utilities Unit has steadily increased over the years to the point where there was no safety margin. Process improvements and equipment modifications were needed in order to meet current plant demand. The Utilities Team evaluated different opportunities for producing demineralized water in a way that would allow a reduction in the overall cost of operating the system. The result of the evaluation was to retrofit one existing Co-Flow demineralizer train to the Amberpack Reverse-Flow System. The results of this change to the Amberpack System has allowed a significant cost savings of \$453,120 per year and has tripled the original flow rates. Included is a history on the retrofitted unit from start-up to present. This paper will discuss problems encountered during start-up, troubleshooting methods, operational changes, corrective actions, and successful results.

4:10pm Prepared Discussion:
Andre Medete - *Dow Chemical, Germany*

4:20pm Closure & Floor Discussion

**SESSION E
ENGINEERING SOFTWARE APPLICATIONS****William Penn Room, Lower Lobby**

Session Chair: Mark Isaacs, AEA Technology, Inc.,
Pittsburgh, PA

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

Discussion Leader: Robert Quinn, RQ Associates, Teaneck, NJ

**2:00 pm New Information Tools in Wastewater Treatment
Technology**

Author: Peter Martin - *AEA Technology plc., Didcot,
Oxfordshire, U.K.*

IWC-97-64 Progress Report

Technology textbooks and manuals from time to time employ decision trees or logic flow charts to help the reader quickly to find his or her way around a technology, and/or to inform decision making. This potentially powerful tool is under-used, and on paper becomes unwieldy if it is to be thorough. Here we describe 'Live Decision Tree' software for water treatment in which information is presented on-screen in the style of a decision tree but avoiding the clutter of a 'paper' version. The resulting presentation is more intuitive than a conventional expert system and the logic process is more transparent.

2:20pm Floor Discussion

**2:30 pm CFD Modeling of the Dispersion of Contaminants
in the Clinch River**

Author: Mark W. Wendel - *Oak Ridge National Laboratory,
Oak Ridge, TN*

Co-author: P.T. Williams, J.H. Platfoot - *Oak Ridge
National Laboratory, Oak Ridge, TN*

IWC-97-63 Paper

This paper describes the simulation of the dispersion and dilution of dissolved or finely-suspended contaminants entering the Clinch River (in the Tennessee Valley) from White Oak Creek. Three dimensional computational fluid dynamics is being used to predict exposure to the public following an hypothetical spill.

2:55pm Prepared Discussion:
Harvey Pordal - *AEA Technologies, Pittsburgh, PA*

3:05pm Closure & Floor Discussion

**3:20pm Coffee Break – Sponsored by Capital Controls Co.,
Culligan International, Sybron Chemicals, Inc.**

3:40pm Optimization of Wastewater Treatment Facilities Using Process Simulation

Author: Demetri P. Petrides - *Intelligen, Inc. Scotch Plains, NJ*

IWC-97-65 Paper

The increasingly stringent environmental regulations on discharge standards have rendered the design and operation of wastewater treatment facilities a challenging task. Such new requirements include the need to track the fate of VOC's heavy metals and other hazardous chemicals in treatment processes and to remove effective nutrient compounds. This paper focuses on the use of process simulation for solving the above problems.

4:05pm Prepared Discussion:

John Schubert - *Modular Environmental Technologies, Inc., Pittsburgh, PA*

4:15pm Closure & Floor Discussion

4:30pm Using Predictive Technology to Control Corrosion in a Raw Cooling Water Systems

Author: Douglas P. Munson - *Electric Power Research Institute, Palo Alto, CA*

Co-authors: V.K. Chexal, J.S. Horowitz, K. Shye, C.S. Spalaris - *Electric Power Research Institute, Palo Alto, CA*

IWC-97-84 Paper

The raw cooling water systems of power and industrial processing plants are degraded by a variety of mechanisms. The diversity of these attacks, complexity of many of the raw cooling water systems, season variations, and EPA effluent discharge limits make the problem difficult for even the most experienced engineer. To help plant owners understand and control these attacks, EPRI has been developing technology to predict where in the system each form of degradation is most likely to attack. This has been achieved by developing predictive models for the most common forms of corrosion and installing the models on computer software which allow a given system to be evaluated to whatever level of detail desired by the owner.

4:55pm Prepared Discussion

Dr. Ben Boffardi - *Boffardi and Associates, Pittsburgh, PA*

5:05pm Closure & Floor Discussion

**WEDNESDAY SESSION A
UPGRADING DEMINERALIZER PERFORMANCE****Grand Ballroom, 17th floor****Session Chair: Michael Gottlieb, ResinTech, Cherry Hill, NJ****IWC Representative: David McFayden, CH2M Hill, Pittsburgh, PA****Discussion Leader: William Bornak, Aqueous Solutions, Richboro, PA****8:00 am Demineralizer Reconfiguration Provides Added Capacity and Reduces Chemical Usage**

Author: Kara Millhollin - *ARCO Products Company, Ferndale, WA*

Co-author: Gloria K. Shelton - *Baker Industrial Chemicals, Bellingham, WA*

IWC-97-66 Paper

The three trains of a dedicated, two-bed (SAC/SBA) make-up demineralizer were split and a decationized water header was installed to distribute the cation effluent to the anion vessels. This reconfiguration permitted optimization of the regeneration procedures, resulting in savings of \$400,000 per year in regenerants. Concurrent regeneration of a cation and an anion vessel increased water-producing capacity by 60%.

8:25 am Prepared Discussion:
John Zupanovich - *Chemtreat, Inc., Glen Allen, VA*

8:35 am Closure & Floor Discussion

8:50 am Ion Exchange Systems: Big Problems, Small Solutions

Author: Ken Pandya - *Advanced Water Technologies Services, Inc., Plano, TX*

IWC-97-67 Paper

Inefficient operation of demineralizers can cause great concerns in terms of increased O&M costs and loss of throughput capacities. In many cases, the system's performance can be returned to original performance specs by making small changes such as proper resin selection, changing internals, or better regeneration procedures, some of these techniques and case histories will be presented.

9:15 am Prepared Discussion:
Bill Runyan - *Cochrane Environmental Systems, King of Prussia, PA*

9:25 am Closure & Floor Discussion

9:40am Making Old Makeup Mixed Beds Make More Good Water

Author: Dr. Sallie C. Fisher - *Puricons, Inc., Malvern, PA*

IWC-97-68 Paper

Upgrading the performance of old makeup mixed beds is often just a matter of finding out what goes on inside them. The paper shows how to go about doing this and gives typical illustrations of what may be found.

10:05am Prepared Discussion:

Bill Colletto - *Water Consulting Specialists, New Hope, PA*

10:15am Closure & Floor Discussion

10:30am Coffee Break – Sponsored by Calgon Corporation**10:45am Retrofit of Existing Demineralizers to Improve Efficiency**

Author: Peter S. Meyers - *ResinTech, Inc., Cherry Hill, NJ*

IWC-97-69 Paper

With the recent interest in packed bed technology, many companies are considering retrofitting existing cflow demineralizers to take advantage of packed beds benefits. However, the modifications required to convert a cflow demineralizer into a packed bed are far more extensive than most people realize. This paper will discuss the aspects required for modifying a cflow demineralizer to a packed bed, and the possibilities for simpler modifications that achieve much of the same desired improvements.

11:10am Prepared Discussion:

Dan Rice - *Dow Chemical Company, Midland, MI*

11:20am Closure & Floor Discussion

**SESSION B
NON-CONVENTIONAL MICROBIAL
CONTROL METHODS****Urban Room, 17th floor**

Session Chair: Chris Wiatr, Calgon Corporation, Pittsburgh, PA

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

Discussion Leader: Michael Trulear, Chem-Treat, Richmond, VA

8:00am Five Years of Operating Experience with the SIDTEC® On-Line Mechanical Condenser Tube Cleaning System

Author: James F. Echols - *Betz Dearborn, Houston, TX*

Co-author: Ron Jones - *Texas Utilities, Longview, TX*

IWC-97-70 Paper

Since 1992, a new approach to on-line mechanical condenser tube cleaning has eliminated oxidizing biocides used to maintain steam condenser cleanliness on once-through or closed loop recirculating cooling water systems. Twenty-five unit-years of experience with the SIDTEC® Condenser Maintenance Program are examined with emphasis on demonstrable improvement of condenser performance.

8:25 am Prepared Discussion:

Robert Renfflen - *Taprogge Americas, Inc., Woodbury, NY*

8:35 am Closure & Floor Discussion

8:40 am Enzyme Technology – A Tool for the Prevention and Mitigation of Microbiologically Influenced Corrosion

Author: Richard W. Lutey, Ph.D. - *Buckman Laboratories International, Inc., Memphis, TN*

IWC-97-71 Progress Report

The use of enzymes may offer a means to prevent or mitigate microbiologically influenced corrosion (MIC). The enzyme technology is proposed to provide distinct environmentally related advantages needed to overcome limitations of biocides and hazardous cleaning chemicals. This progress report discusses the author's perception of the status of enzyme technology for preventing and mitigating MIC in industrial process water systems.

9:00 am Floor Discussion

9:10 am Evaluation of a Novel Intermittent Ozonation Technology for Biofouling Control

Author: Shigeki Nakayama - *Mitsubishi Electric Corporation, Tokyo, Japan*

Co-authors: T. Ogawa, T. Tamura, S. Fujiwara, T. Ozawa - *Power and Industrial System Center, Wadamisaki-cho, Kobe, Japan*; Y. Tanimura, S. Shiono - *Advanced Technology R&D Center, Tsukaguchi-Honmachi, Amagasaki, Japan*; S. Nakayama - *Environmental Business Development Center, Marunouchi, Chiyoda-ku, Tokyo, Japan*; D.W. Evans, D.K. Jain, A. Oad, G.I. Ogundele - *Ontario Hydro Technologies, Toronto, Ontario, Canada*; R. Claudi - *Ontario Hydro Nuclear, Toronto, Ontario, Canada*

IWC-97-72 Paper

Intermittent ozonation of flowing lakewater significantly reduced the extent of biofouling and deposit formation in the demonstration test rig. Microbial settlement on heat exchanger, effect on adult zebra mussels and the others

were examined to confirm the effectiveness of the intermittent ozonation for preventing biofouling in lakewater cooling system.

9:35 am Prepared Discussion:
Wayne C. Micheletti - *Wayne C. Micheletti, Inc., Charlottesville, VA*

9:45 am Closure & Floor Discussion

9:50am Coffee Break – Sponsored by Calgon Corporation

11:00am Use of Surfactants to Control Silt and Biofilm Deposition onto PVC Fill in Cooling Water Systems

Author: Dr. Rodney M. Donlan - *Calgon Corporation, Pittsburgh, PA*

Co-author: David L. Elliott, Donald L. Gibbon - *Calgon Corporation, Pittsburgh, PA*

IWC-97-73 Paper

Biofilms entrap silt and clay particles resulting in the fouling of high efficiency cooling tower fill. Studies were performed to determine whether treatment of cooling water with nonionic surfactants would control this fouling. Results indicated that treatment both minimized bacterial adhesion and reduced silt deposition onto the biofouled surfaces.

11:25 am Prepared Discussion:
Tony Dallmier - *Nalco Chemical Company, Naperville, IL*

11:35 am Closure & Floor Discussion

SESSION C INNOVATIONS IN MEMBRANE SYSTEMS

William Penn Room, Lower Lobby

Session Chair: Ed Geishecker, Ionics, Incorporated, Watertown, MA

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

Discussion Leader: Richard Myers, Dupont Permasep Products, Newark, DE

8:00am RO System Design for Surface Sources

Author: Wayne Bates - *Hydranautics, Oceanside, CA*

Co-author: Randy Majerle - *Argo Scientific, San Marcos, CA*

IWC-97-74 Paper

The majority of brackish water RO systems need to process feed water from surface sources. Surface water sources are notorious for higher level of foulants, requiring enhanced attention to RO system and RO

pretreatment design. This paper will focus on existing and new design concepts.

8:25 am Prepared Discussion:
Mark Thompson - *Malcolm Pirnie Incorporated, Newport News, VA*

8:35 am Closure & Floor Discussion

8:50 am Reduction of TOC/THM Contaminants Out of a UF-RO-EDI Membrane System at PECO's Limerick Generating Station

Author: Wanda R. Harrison - *PECO Energy Company, Sanatoga, PA*

Co-author: Sandy J. Schexnailder - *Ionics, Incorporated, Arlington, TX*

IWC-97-75 Paper

PECO Energy's development and use of an innovative analytical procedure at the Limerick Generating Station (LGS) has resulted in significant changes in both the operation of LGS' pretreatment system and the makeup water treatment system process design. The use of this procedure has exposed previously unknown and unmeasured contaminant levels in the ultrapure makeup water being fed to the stations reactor and auxiliary boiler. This report will present the evolution and significant performance improvements made when LGS' installed an Ionics Triple Membrane Trailer (TMT) based makeup treatment system, as well as a description of the analytical technique used in monitoring performance.

9:15 am Prepared Discussion:
Gary Ganzi - *U.S. Filter, Lowell, MA*

9:25 am Closure & Floor Discussion

9:40 am A New High Flow Modular Electrodeionization Design

Author: William E. Haas - *Ecolochem, Inc., Norfolk, VA*

Co-authors: Jay Grafton - *TVA Brown's Ferry Nuclear Plant, Athens, AL*; David F. Tessier, I. Glenn Towe - *Glegg Water Conditioning, Inc., Guelph, Ontario, Canada*

IWC-97-76 Paper

Electrochemical deionization (EDI) offers continuous demineralization at water recovery rates greater than 90%. High purity polishing of RO permeate, once only accomplished with mixed bed demineralization, can now be achieved with EDI technology without the need for regenerant chemicals and their associated regenerant waste. Although EDI technology has been used in industrial applications, its wider acceptance requires the satisfactory resolution of outstanding capital cost and performance issues for flow rates in the 100 gpm and greater range. TVA Brown's Ferry Nuclear Plant's experience with EDI will be discussed.

10:05am Prepared Discussion:
Li Zhang - *Ionics Incorporated, Watertown, MA*

10:15am Closure & Floor Discussion

10:30am Coffee Break – Sponsored by Calgon Corporation

10:45am Ceramic Membrane Pretreatment of Warm Surface Water Supplies for Feed to Thin Film Composite Reverse Osmosis Systems

Author: Joseph Hooley - *U.S. Filter, Middleburg Heights, OH*

Co-authors: Jeff J. Peters, John F. Bossler - *U.S. Filter, Rockford, IL*

IWC-97-77 Paper

The paper will review field trial performance data for MembraPro® Ceramic Microfiltration for Reverse Osmosis System, treating Brazos River surface water supply at two separate plant sites in Texas. Also, past experiences using more conventional pretreatment technologies will be reviewed.

11:10am Prepared Discussion:
Scott Wittwer - *Graver Separations, Inc., Glasgow, DE*

11:20am Closure & Floor Discussion

11:30am Microfiltration Technology – The Next Generation

Author: F.A. Tonelli - *ZENON Environmental Systems, Inc., Burlington, Ontario, Canada*

Co-author: Steve Kroll - *ZENON Environmental Systems, Inc., Edmonton, Alberta, Canada*

IWC-97-78 Progress Report

ZeeWeed® microfiltration technology is now being applied successfully in applications where a consistent quality of feedwater is required prior to Reverse Osmosis. These outside/in polymeric membranes are immersed directly inside a process tank and operate by applying a small suction to the membrane's lumen. The permeate quality is essentially free of any suspended solids and turbidity.

11:50am Floor Discussion

SESSION D IMPLEMENTING PWR SECONDARY WATER CHEMISTRY GUIDELINES

Monongahela Room, 17th floor

Session Chair: Mike Rootham, Westinghouse Corporation, Madison, PA

IWC Representative: Andrew Calderwood, Westinghouse Corporation, Madison, PA

8:00am Using Carbohydrazide in Nuclear Utility Applications

Author: Peter D. Hicks - *Nalco Chemical Company, Naperville, IL*

Co-author: Richard J. Mouché - *Nalco Chemical Company, Naperville, IL*

IWC-97-81 Paper

The use of carbohydrazide in the secondary side of pressurized water reactors is discussed, both for wet layup and on-line use. Case studies and technical justification are presented for replacing unsafe hydrazine with safer products containing carbohydrazide. Time Optimization of Water Chemistry in LWR's

8:35 am Floor Discussion

8:50 am Optimization of Water Chemistry in LWR's

Author: Peter J. Millett - *Electric Power Research Institute, Palo Alto, CA*

Co-Author: Chris Wood - *Electric Power Research Institute*

IWC-97-79 Progress Report

This paper discusses the water chemistry options that have been developed and implemented in US LWRs to eliminate or reduce corrosion damage, reduce radiation fields and to minimize O&M costs in the reactor and steam systems. A number of cost effective mitigation options such as molar ratio control and alternate amines for PWR secondary systems and zinc and hydrogen water chemistry for BWRs have been developed and implemented in US LWRs. Computer tools have been developed to help utilities select the most appropriate water chemistry program for their plant. Statistics and implementation trends for US plants are discussed in this paper.

9:10 am Floor Discussion

9:20 am Application of the EPRI PWR Secondary Water Chemistry Guidelines - Revision 4, at the Palisades Nuclear Power Plant

Author: Joel McElrath - *Consumers Energy, Covert, MI*

IWC-97-80 Progress Report

Revision 4 of the Secondary Water Chemistry Guidelines includes section 4, which discusses a methodology for plant-specific optimization of secondary system chemistry management. The intent of the section is to provide a framework whereby each PWR nuclear unit can develop its chemistry management program according to equipment and company priorities. The end result is a documented evaluation that allows a utility to clearly organize its chemistry policies and intents, such that prioritized equipment longevity is maintained.

The Palisades Nuclear Plant of Consumers Energy (formerly Consumers Power Company) has conducted such a study. The Palisades study is, in fact, presented in Appendix A, "Site-Specific Optimization of Secondary Water Chemistry", of revision 4 of the guidelines. The Palisades study demonstrates application of section 4 of the guidelines for a PWR plant with recently replaced steam generators and no condensate polishers.

9:40 am Floor Discussion

9:50 am Coffee Break – Sponsored by Calgon Corporation

10:05 am Application of the EPRI Secondary Water Chemistry Guidelines, Revision 4; At the Diablo Canyon Nuclear Power Plant

Author: Jeffrey Gardner - *Pacific Gas & Electric, Avila Beach, CA*

IWC-97-83 Progress Report

Revision 4 of the Secondary Water Chemistry Guidelines includes section 4, which discusses a methodology for plant-specific optimization of secondary system water chemistry management. The Diablo Canyon Nuclear Plant (1/2) of Pacific Gas and Electric Company has conducted such a study, which is presented in Appendix A, "Site-Specific Optimization of Secondary Water Chemistry", of revision 4 of the guidelines. The Diablo Canyon study demonstrates application of section 4 of the guidelines for a sea water cooled PWR plant with full flow deep bed condensate polishers. The thought process used in developing the Diablo Canyon study and evaluation will be presented as part of the panel discussion on the above topic.

10:25 am Floor Discussion

WEDNESDAY, NOVEMBER 5, 1997

All workshops are located in the Conference Center on the Club Level

1:00pm Industrial Boiler Water Treatment Programs –
Introductory Course

Industrial Cooling Water Treatment Programs –
Introductory Course

Design, Maintenance and Troubleshooting for
Membrane Water Treatment Systems

Detection and Mitigation of Microbiologically
Influenced Corrosion – Part One

5:00pm Workshops Conclude

THURSDAY, NOVEMBER 6, 1997

All workshops are located in the Conference Center on the Club Level

8:00am Industrial Boiler Water Treatment Programs –
Advanced Course

Industrial Cooling Water Treatment Programs –
Advanced Course

Design, Maintenance and Troubleshooting for
Membrane Water Treatment Systems

Detection and Mitigation of Microbiologically
Influenced Corrosion – Part Two

5:00pm Workshops Conclude

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.

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AEA Technology is an international science and engineering services business which solves technical, safety, and environmental problems for government and industries around the world. We give our customers a competitive edge by helping them adapt and exploit technology so they can develop and optimize plant and processes, enhance products, meet safety requirements, and manage environmental challenges.

Monday Hours: 8:00 p.m. - 10:00 p.m.
 Tuesday Hours: 7:30 p.m. - 10:00 p.m.

ALBERMARLE CORPORATION

Contact: Melissa Bennett, *Technical Sales Representative*
 451 Florida Street
 Baton Rouge, LA 70801
 Tele: 504-388-8946
 Fax: 504-388-7848

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

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

ALBRIGHT & WILSON AMERICAS

Contact: Brian K. Failon, *Market Development Manager*
 P.O. Box 4439
 Glen Allen, VA 23058-4439
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Albright & Wilson, an international chemical manufacturer, offers a diverse range of performance products worldwide. Strategic chemistry and manufacturing expertise centers around organic and inorganic phosphorus derivatives. Each focuses on raw materials supplied for industrial and process water treatment, including biocides, phosphonates, phosphoric acid derivatives, and "all-organic" corrosion inhibitors. Specific information on the new BRICORR 288 corrosion inhibitor and TOLCIDE PS series of THPS biocides will be available.

Sunday Hours: 8:00 p.m. - 11:00 p.m.
 Monday Hours: 5:00 p.m. - 10:00 p.m.
 Tuesday Hours: 5:00 p.m. - 10:00 p.m.

ALCO CHEMICAL

Contact: Chet Kawa, *Commercial Development Mgr.*
909 Mueller Drive
P.O. Box 5401
Chattanooga, TN 37406
Tele: 423-629-1405
Fax: 698-8723

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

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

AMBI-DESIGN, INC.

Contact: Shan S. Sundaram, P.E., *President*
4654 Crested Butte Trail
Rockford, IL 61114
Tele: 815-964-7568
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AMBI-Design, Inc. designs, engineers and builds custom designed large water treatment, chemical purification/recovery and wastewater treatment systems. Please visit our suite #618 to learn about our expertise in systems retrofits, problem solving, performance enhancement and fabricating spare internal distributors (CPVC, SST, Alloy 20, Hastelloy C-276/C-22 construction, screened as well as wedgewire covered type). If you give us your local cost figures, we will estimate the economic crossover TDS value (ECTV) for your firm.

Sunday Hours: 4:00 p.m. - 12:00 a.m.
Monday Hours: 6:00 p.m. - 12:00 a.m.
Tuesday Hours: 8:00 a.m. - 12:00 a.m.
Wednesday Hours: 8:00 a.m. - 11:00 a.m.

AQUATECH INTERNATIONAL CORPORATION

Contact: J.N. Sharma, *Vice President*
One Four Coins Drive
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Fax: 412-746-5359
E-mail: aquatech@nb.net

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Sunday Hours: 7:00 p.m. - 10:00 p.m.
Monday Hours: 10:00 a.m. - 10:00 p.m.
Tuesday Hours: 11:00 a.m. - 10:00 p.m.

ASHLAND CHEMICAL/DREW INDUSTRIAL DIVISION

Contact: Joan Tiedrich, *Marketing Services Admin.*

One Drew Plaza

Boonton, NJ 07005

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

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

BAYER CORPORATION

Contact: Tony DeCola, *Product Manager*

100 Bayer Road

Pittsburgh, PA 15205-9741

Tele: 412-777-7464

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Sunday Hours: 5:00 p.m. - 12:00 a.m.

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

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

BETZDEARBORN INC.

Contact: Rick Sova, *Director - Marketing*

200 Witmer Road

Horsham, PA 19044

Tele: 215-773-6578

Fax: 215-773-6133

E-mail: www.betzdearborn.com

Water treatment products and engineering services for boiler, process cooling, HVAC, influent and wastewater treatment systems.

Sunday Hours: 2:00 p.m. - 8:00 p.m.

Monday Hours: 11:00 a.m. - 2:00 p.m.

5:00 p.m. - 8:00 p.m.

Tuesday Hours: 11:00 a.m. - 2:00 p.m.

5:00 p.m. - 8:00 p.m.

BILTMORE PRODUCTS CO., INC.

Contact: Brian D. Regan, *Vice President*

5372 Enterprise Blvd.

Bethel Park, PA 15102

Tele: 412-831-0250

Fax: 412-831-3557

Process system engineering & components for surface water, wastewater and process water treatment. Pall Advanced Separation.

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

Tuesday Hours: 9:00 a.m. - 7:00 p.m.

Wednesday Hours: 9:00 a.m. - 12:00 p.m.

BUCKMAN LABORATORIES, INC.

Contact: Michael N. Charnigo, *Group Business Manager -
Formulator Chemicals*

1256 North McLean Blvd.

Memphis, TN 38108-0305

Tele: 800-937-7551

Fax: 978-745-5174

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 a mature field force that carries a proven history of dependability and creative problem solving techniques for their customers.

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.

CALGON CORPORATION

Box 1346

Pittsburgh, PA 15230

Tele: 412-494-8000

Calgon Corporation's InfoShare Suite will offer information concerning Calgon's extensive water treatment and surface treatment capabilities, as well as the synergistic benefits Calgon can offer its many customers through its strategic alliances with The Indeck Group of Companies, Inc., h.e.r.c. Products, Inc. and Earth Tech. Calgon will also unveil its new organization of dedicated, stand-alone business groups developed to offer an extensive menu of value-added products and services tailored to specific industries.

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

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

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

THE CAPITAL CONTROLS GROUP

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

P.O. Box 211

Colmar, PA 18915

Tele: 215-997-4031

Fax: 215-997-4062

E-mail: rmitman@capitalcontrols.com

Chlorine, ammonia, sulfur dioxide gas feeders; on-site generated sodium hypochlorite or chlorine dioxide; on-line monitors for ammonia, chlorine, phosphate, and other ions in water.

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

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

COCHRANE, INC.

Contact: Bill Runyan, *Marketing Mgr. - Water Treatment*
 800 Third Avenue
 King of Prussia, PA 19406
 Tele: 610-265-5050
 Fax: 610-265-5432
 E-mail: Runyan@Cochrane.com

Cochrane has devoted over 130 years to the development of quality water treatment systems. Our products and services include build-own-operate-maintain "BOOM" systems, deaerators of all types, hot and cold softeners, make-up and condensate demineralizers, reverse osmosis, ultrafiltration, decarbonators; clarifiers, filters, heat recovery; and steam specialties.

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

**CODELINE DIVISION OF STRUCTURAL NORTH AMERICA
(AKA ADVANCED STRUCTURES, INC.)**

Contact: Doug Eisberg, *Sales Director*
 2181 Meyers Avenue
 Escondido, CA 92029-1002
 Tele: 760-738-3000
 Fax: 760-738-3031
 E-mail: douge@codeline.com

Manufactures fiberglass pressure vessels for reverse osmosis (RO), ultrafiltration (UF) and membrane softening applications in 2.5", 4", 8" diameters. Design pressures range from 150 psi through 1200 psi. Certified by ASME to design, fabricate and code-stamp vessels to Section X (RP) of the Boiler and Pressure Code. CodeLine offers a unique side-porting option which gives users a distinct advantage. Side porting allows direct, permanent connection to the high-pressure manifold, resulting in the most compact and economical piping arrangement possible. With newest multiple port option, piping requirement may be completely eliminated. Next generation 8" and 4" now available.

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

CULLIGAN/DEWPLAN

Contact: Young Lee, *Sr. Marketing Mgr.*
 One Culligan Parkway
 Northbrook, IL 60062
 Tele: 847-205-5707
 Fax: 847-205-6001
 E-mail: ylee@culligan.com

One of the world's leading manufacturers, distributors and specialist design contractors for high purity and ultrapure industrial water treatment systems.

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

DIONEX CORPORATION

Contact: Beverly Newton, *Market Manager*
North Pointe Commons
9 East Stow Road
Marlton, NJ 08053
Tele: 408-481-4272
Fax: 408-737-2470
E-mail: beverly_newton@dionex.com

Dionex is a leading developer and manufacturer of laboratory and process analytical systems and software. Dionex specializes in trace level detections of ions in water.

Sunday Hours: 7:00 p.m. - 10:00 p.m.
Monday Hours: 10:00 a.m. - 10:00 p.m.
Tuesday Hours: 10:00 a.m. - 10:00 p.m.

THE DOW CHEMICAL CO.

Contact: Amy Ahlich
Liquid Separations, Customer Information
P.O. Box 1206
Midland, MI 48641-1206
Tele: 517-636-0067
Fax: 517-636-1630
E-mail: alahlich@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. - 7:30 p.m.
Tuesday Hours: 4:30 p.m. - 7:30 p.m.

EBARA CORPORATION**NUCLEAR ENGINEERING DIV.**

Contact: Takeski Izumi
Tele: 81-3-5461-6532
Fax: 81-3-5461-6508
E-mail: isumi01@shi.ebara.co.jp

ECO-TEC INC.

Contact: Cathy Fletcher, *Group Leader - Water Treatment*
1145 Squires Beach Road
Pickering, Ontario L1W 3T9
Canada
Tele: 905-427-0077
Fax: 905-927-4477

Counter-current, packed bed ion exchange... and more. The RECOFLO® process combines advanced design features, resulting in the best that IX technology has to offer. RECOFLO® water demineralization systems are used in the power generation, automotive and chemical industries, and anywhere else that high purity water is essential.

Sunday Hours: 6:30 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.

ECOLOCHEM, INC.

Contact: Paul C. Hoppenjans, *Marketing Services Manager*
 4545 Patent Road
 Norfolk, VA 23502
 Tele: 757-855-9000
 Fax: 757-855-1478

Outsourced make-up water treatment systems for temporary requirements to long-term needs, featuring the DeltaFlow™ System, a new chemical-free all-membrane ultrapure treatment process.

Sunday Hours: 5:00 p.m. - 11:00 p.m.
 Monday Hours: 1:00 p.m. - 12:00 a.m.
 Tuesday Hours: 1:00 p.m. - 12:00 a.m.

ENVIRONMENTAL DYNAMICS CORPORATION

Contact: Nancy Gleasman Foor, *General Manager*
 210 New Factory Road
 Sharon, WI 53585
 Tele: 414-736-4211
 Fax: 414-736-4214

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: 4:00 p.m. - 7:00 p.m.
 Monday Hours: 5:00 p.m. - 11:00 p.m.
 Tuesday Hours: 5:00 p.m. - 11:00 p.m.

EPICOR, INCORPORATED

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. Also, specially-formulated, custom-blended bead resin. OEM distributor for Rom & Haas, Dow and Sybron.

FMC CORPORATION

Contact: Paul Turgeon, *Sales and Marketing Manager*
 1735 Market Street
 Suite 1868
 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 bring your business card to our Monte Carlo Night on Monday in the Sternwheeler Room, Lower Lobby, Westin William Penn.

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

GLEGG WATER CONDITIONING

29 Royal Road
Guelph, Ontario NH 1G2
Canada
Tele: 519-836-0500

Glegg Water Conditioning, Inc. is a leading supplier of high quality water purification equipment for steam generation, industrial process, semiconductor and pharmaceutical applications. GWC offers custom engineered systems for specific applications or reference design for installations requiring ultra-reliable equipment without custom engineering.

Sunday Hours: 6:00 p.m. - 11:00 p.m.
Monday Hours: 8:00 p.m. - 11:00 p.m.
Tuesday Hours: 5:00 p.m. - 11:00 p.m.

GRAVER TECHNOLOGIES

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®, POWDEX® and ECODEX® powdered ion exchange resins; whole bead resins manufactured by major ion exchange companies; AEGIS® precoat filters and septa, AFA™ pleated filters, DUALGUARD™ filters and SCEPTER® sintered metal membranes. We specialize in condensate make-up and all other water purification systems in utility power plants.

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

GRAVER WATER

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

Graver designs and manufactures water & wastewater treatment systems. Our engineers are knowledgeable in process & equipment designs involving feedwater, condensate, evaporators and wastewater.

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

Contact: James Hensel, *Product Manager*
P.O. Box 389
Loveland, CO 80539
Tele: 800-227-4224 x 2712
Fax: 970-669-2932

Hach Company provides field, laboratory and process analysis products for water analysis. Parameters include silica, hardness, turbidity, chlorine and more.

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

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

h.e.r.c. PRODUCTS INCORPORATED

Contact: Steven Carl, *Chairman and CEO*

2202-15 W. Lone Cactus Drive

Phoenix, AZ 85027-2621

Tele: 602-492-0336

Fax: 602-233-1107

E-mail: herc@hercprod.com

h.e.r.c. Products Inc. develops, manufactures and markets products for the removal and control of scale and tuberculation on surfaces that come in contact with industrial and potable water.

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

Monday Hours: 2:00 p.m. - 7:00 p.m.

9:00 p.m. - 11:00 p.m.

Tuesday Hours: 2:00 p.m. - 7:00 p.m.

9:00 p.m. - 11:00 p.m.

HONEYWELL ANALYTICAL

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 Analytical – Sensor and Instrument Innovation for pH, ORP, Dissolved Oxygen, Specific Ions, Conductivity/Resistivity/TDS.

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

Monday Hours: 12:00 p.m. - 9:00 p.m.

Tuesday Hours: 12:00 p.m. - 9:00 p.m.

Wednesday Hours: 8:00 a.m. - 12:00 p.m.

HYDROCHEM INDUSTRIAL SERVICES

Contact: Steven J. Barber, *National Marketing*

6210 Rothway

Houston, TX 77040

Tele: 281-326-1677

Fax: 281-326-2446

Hydrochem Industrial Services provides a full line of industrial cleaning services including chemical cleaning, hydroblasting, vacuuming, oil flushing, dewatering and waste treatment.

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

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

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

INDECK WATER TREATMENT SYSTEMS

Contact: Bruce Tait, *Vice President*

1111 South Willis Avenue

Wheeling, IL 60090

Tele: 800-446-3325
 Fax: 847-541-8300
 E-mail: ipecwater@aol.com

Indeck designs and manufactures ultrapure water treatment systems including packed bed demineralizers, R.O. and U.F. systems, as well as electrodeionization.

Sunday Hours: 5:00 p.m. - 11:00 p.m.
 Monday Hours: 2:00 p.m. - 7:00 p.m.
 9:00 p.m. - 11:00 p.m.
 Tuesday Hours: 2:00 p.m. - 7:00 p.m.
 9:00 p.m. - 11:00 p.m.

INFILCO DEGREMONT, INC.

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

IDI is a long-established water and wastewater technology/equipment provider to industry and municipalities. Design/Build contracts are our specialty. New technologies developed in R&D Centers in Europe and the USA (opened this year). Contact Marek Mierzejewski for industrial applications.

Sunday Hours: 6:00 p.m. - 10:00 p.m.
 Monday Hours: 5:00 p.m. - 12:00 a.m.
 Tuesday Hours: 5:00 p.m. - 10:00 p.m.
 Wednesday Hours: 8:00 a.m. - 11:00 a.m.

IONICS, INCORPORATED

Contact: Francine S. Bernitz, *Marketing Director*
 65 Grove Street
 Watertown, MA 02172
 Tele: 617-926-2510 x312
 Fax: 617-926-4304
 E-mail: fbernitz@ionics.com

(Including the following Ionics subsidiaries: Ionics Resources Conservation Company and Sievers Instruments) Ionics is a global separations technology company involved worldwide in filling Total Water Quality™ needs. Ionics is involved in the following major business sectors: Membranes and related equipment; Instrumentation for monitoring: Water, food and chemical supply, and Consumer products. Ionics' membranes and equipment are used for the purification, concentration, treatment and analysis of water and wastewater. Ionics is a pioneer in the "own and operate" service segment of purified water supply, is involved in both the bottled water and home water purification systems businesses, and provides a complete range of water quality monitoring solutions.

Sunday Hours: 5:00 p.m. - 9:00 p.m.
 Monday Hours: 7:30 a.m. - 7:00 p.m.
 Tuesday Hours: 7:30 a.m. - 7:30 p.m.
 Wednesday Hours: 7:30 a.m. - 10:00 a.m.

JOHNSON MARCH SYSTEMS, INC.

Contact: Bill Herbert, *Sales Manager*
 220 Railroad Drive
 Ivyland, PA 18974
 Tele: 215-364-2500
 Fax: 215-364-5425

Custom steam/water sampling panels, skid-mounted chemical dosing systems to inject boiler, cooling water, process additives including polymers, liquid chlorine and hypochlorite (purchased and from seawater).

Sunday Hours: 5:00 p.m. - 12:00 a.m.
 Monday Hours: 8:30 a.m. - 12:00 a.m.
 Tuesday Hours: 8:30 a.m. - 12:00 a.m.
 Wednesday Hours: 8:30 a.m. - 11:30 a.m.

MECO

Contact: Alasdair MacIver, *Senior Project Manager*
 861 Carondelet Street
 New Orleans, LA 70130
 Tele: 504-599-4000
 Fax: 504-599-4100
 E-mail: amaciver@meco.com

Mechanical Equipment Company, Inc. (MECO) is a world leader in the design, manufacture and service of water purification plants. Processes and equipment include 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: 6:00 p.m. - 10:00 p.m.
 Tuesday Hours: 6:00 p.m. - 10:00 p.m.

MICROTECK CONTROLS

Contact: Apple White, *Sales Engineer*
 6241 Ravenna Road, Suite C-12
 Twinsburg, OH 44087
 Tele: 412-788-9098
 Fax: 412-788-8683

MicroTek Controls is the regional authorized distributor for Wonderware FactorySuite, an integrated suite of software products for process control.

Monday Hours: 6:00 p.m. - 9:00 p.m.
 Tuesday Hours: 6:00 p.m. - 9:00 p.m.

**MILTON ROY COMPANY
FLOW CONTROL DIVISION**

Contact: Robin Havay, *Advertising/Tradeshow Coordinator*
 201 Ivyland Road
 Ivyland, PA 18974
 Tele: 215-441-0800
 Fax: 215-441-8620
 E-mail: advertis@miltonroy.com

Flow Control Division designs and builds customized modular dosing systems for the chemical, oil and gas, pulp and paper, food, water treatment and other industries.

Monday Hours: 2:00 p.m. - 4:00 p.m.
6:00 p.m. - 10:00 p.m.

MITSUBISHI CHEMICAL AMERICA, INC.

Contact: Alan D. Sharpe, *General Manager*
81 Main St.
Suite 401
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 Diaion exchange resins and synthetic adsorbents for industrial water and wastewater applications

Sunday Hours: 7:00 p.m. - 10:00 p.m.
Monday Hours: 6:30 p.m. - 11:00 p.m.
Tuesday Hours: 6:30 p.m. - 11:00 p.m.

MITSUBISHI ELECTRIC POWER PRODUCTS, INC.

Contact: Jack Greaf, *V.P. Marketing*
512 Keystone Drive
Warrendale, PA 15086
Tele: 412-772-2120
Fax: 412-772-2146
E-mail: jgreaf@msm.me.com

Mitsubishi Electric Power Products, Inc., an affiliate of Mitsubishi Electric Corporation of Japan, is introducing "MABOS" — Mitsubishi Anti Biofouling Ozone System for Industrial and Utility Cooling Water Systems. See this novel *intermittent* ozonation system in our suite.

Sunday Hours: 8:30 p.m. - 10:00 p.m.
Monday Hours: 2:00 p.m. - 5:00 p.m.
7:00 p.m. - 10:00 p.m.
Tuesday Hours: 2:00 p.m. - 5:00 p.m.
7:00 p.m. - 10:00 p.m.
Wednesday Hours: 1:00 p.m. - 4:00 p.m.

MPW INDUSTRIAL WATER

150 South 29th Street
Newark, OH 43055
Tele: 800-842-4355

MPW Industrial Water specialties in providing water purification services to industry. 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 an MPW industrial Water 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: 8:00 a.m. - 11:00 p.m.
Tuesday Hours: 8:00 a.m. - 11:00 p.m.

NALCO CHEMICAL CO.

Contact: Wayne Bernahl, *Senior Consultant*
 One Nalco Center
 Naperville, IL 60563-1159
 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 4:00 p.m. - 10:00 p.m.
 Monday Hours: 4:00 p.m. - 11:00 p.m.
 Tuesday Hours: 4:00 p.m. - 11:00 p.m.

ORION RESEARCH, INC.

529 Main Street
 Boston, MA 02129
 Tele: 617-242-3900

Continuous water quality monitors for low-level detection of calcium hardness, chlorine, chloride, fluoride, dissolved oxygen, sodium and oxygen scavengers.

Monday Hours: 3:00 p.m. - 11:00 p.m.
 Tuesday Hours: 1:00 p.m. - 9:00 p.m.

OSMONICS

Contact: Roger Miller, *Marketing 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 components includes filters, membrane elements and systems, centrifugal pumps, housings and ozone generators.

Monday Hours: 12:00 p.m. - 4:00 p.m.
 7:00 p.m. - 11:00 p.m.
 Tuesday Hours: 12:00 p.m. - 4:00 p.m.
 7:00 p.m. - 11:00 p.m.

PROFESSIONAL WATER TECHNOLOGIES

Contact: Stephen Dunham, *Dir. Sales/Marketing*
 1145 Industrial Ave., Ste. I
 Escindido, CA 92029
 Tele: 760-741-7404
 Fax: 760-741-5645
 E-mail: support@pwtinc.com
 Website: www.pwtinc.com

Develops, manufactures and sells high performance specialty chemicals for RO maintenance and preventative maintenance. Products include powder and liquid antiscalant/dispersants, antimicrobiological pretreatments and membrane cleaners.

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

PSC CHEMICAL PRODUCTS & SERVICES

Contact: Paul Davis, *Sr. Account Manager*
 3044 East Commerce Drive, Ste. E
 Midland, MI 48642
 Tele: 517-839-4476
 Fax: 517-839-4483
 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 & 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. - 8:30 p.m.
 Tuesday Hours: 5:00 p.m. - 8:30 p.m.

PUROLITE COMPANY

150 Monument Road
 Bala Cynwyd, PA 19004
 Tele: 610-668-9090

Purolite cordially invites you to visit our suite to help celebrate our 15th anniversary as a manufacturer of ion exchange resins and adsorbents for a variety of applications.

Sunday Hours: 6:00 p.m. - 12:00 a.m.
 Monday Hours: 5:00 p.m. - 12:00 a.m.
 Tuesday Hours: 5:00 p.m. - 12:00 a.m.

RESINTECH INC.

Contact: Frank DeSilva
 615 Deer Road
 Cherry Hill, NJ 08034-1409
 Tele: 609-354-1152
 Fax: 609-354-6165
 Website: www.resintech.com

Manufacturer and supplier of ion exchange resins, activated carbon, chelating resins and ion selective media for water treatment, waste treatment, product recovery and purification.

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.

ROHM AND HAAS COMPANY – ION EXCHANGE RESINS

Contact: Joseph C. Fanelli, *Business Communications Manager*
 5000 Richmond Street
 Philadelphia, PA 19137
 Tele: 215-537-4041
 Fax: 215-537-4157
 E-mail: mahjcf@rohmmaas.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

Contact: Fred Zaengle, *Market Manager*
100 Independence Mall West
Philadelphia, PA 19106-2399
Tele: 215-592-3185
Fax: 21-5592-2178

Rohm and Haas is a global supplier of polymers to the industrial water treatment market.

Monday Hours: 11:30 a.m. - 1:30 p.m.
2:30 p.m. - 7:30 p.m.
Tuesday Hours: 11:30 a.m. - 1:30 p.m.
2:30 p.m. - 7:30 p.m.

SCIENTIFIC INSTRUMENTS

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 ultrapure/process water for control purposes.

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

SENTRY EQUIPMENT

Contact: Myron Feldman, *VP Domestic Sales*
Box 127
Oconomowoc, WI 53066
Tele: 414-567-7256
Fax: 4114-567-8015
E-mail: myron@sentry-equip.com

Water and steam sampling including a demonstration of new ion chromatography system.

Monday Hours: 1:00 p.m. - 10:00 p.m.
Tuesday Hours: 9:00 a.m. - 10:00 p.m.

SYBRON CHEMICALS INC.

Birmingham Road
P.O. Box 66
Birmingham, NJ 08011
Tele: 800-678-0020

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

Sunday Hours: 6:00 p.m. - 9:00 p.m.
Monday Hours: 7:30 a.m. - 9:00 p.m.
Tuesday Hours: 7:30 a.m. - 9:00 p.m.

THERMAX LIMITED

Contact: Atul Bhagwat, *Manager*
40440 Grand River Avenue
Novi, MI 48375
Tele: 248-474-3050
Fax: 248-476-5790
E-mail: thermaxusa@earthlink.net

Thermax manufactures a wide range of tulsion ion exchangers for a wide range of applications such as demineralization condensate polishing, nuclear power plants and several other specialty chemical, pharmaceutical and sweetener applications.

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

THORNTON ASSOCIATES, INC.

Contact: David Gray, *Product Manager*
1432 Main Street
Waltham, MA 02154
Tele: 781-890-3399
Fax: 781-890-5507
E-mail: dgray@thorntoninc.com

Thornton manufactures Conductivity, pH, ORP, Flow and other water quality instrumentation for monitoring in-line points in sample panels, water treatment systems, cycle chemistry, cooling tower water and boiler feed water. Dave Gray speaks on Cation Conductivity Temperature Compensation on Tuesday p.m.

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.

U.S. FILTER

Contact: Mary Ellen Wilson
40004 Cook Street
Palm Desert., CA 92211
Tele: 908-668-1700
Fax: 908-668-1393

U.S. Filter is the leading global provider of industrial, municipal and residential water and wastewater treatment systems, products and services, as well as a leading provider of outsourced water services including operations at customer sites.

Sunday Hours: 6:00 p.m. - 9:00 p.m.
Monday Hours: 8:00 a.m. - 12:00 a.m.
Tuesday Hours: 8:00 a.m. - 12:00 a.m.
Wednesday Hours: 8:00 a.m. - 12:00 p.m.

WALCHEM CORPORATION

Contact: John Gotthardt, *Product Manager*
Five Boynton Road Hopping
Brook Park
Holliston, MA 01746
Tele: 508-429-1110
Fax: 508-429-7433

Walchem manufactures sensors, pumps and controls used widely in water treatment applications.

Sunday Hours: 8:00 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.

WATER & POWER TECHNOLOGIES, INC.

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

Manufacturer of custom-designed industrial water purification systems, reverse osmosis, demineralization, water-by-the-gallon contracts, mobiles, etc.

Sunday Hours: 8:00 p.m. - 11:00 p.m.
Monday Hours: 6:00 p.m. - 10:00 p.m.
Tuesday Hours: 6:00 p.m. - 10:00 p.m.