



*The Conference on Industrial Water*

## OFFICIAL PROCEEDINGS

### THE INTERNATIONAL WATER CONFERENCE

#### 61st ANNUAL MEETING

OCTOBER 22-26, 2000

Westin William Penn Hotel  
Pittsburgh, Pennsylvania

**Paul O'Boyle**  
*General Chair*

**Fred Potthoff**  
*Program Chairman*

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*IWC Representative:* Alan Smith – *Nalco Chemical Company, Pittsburgh, PA*

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

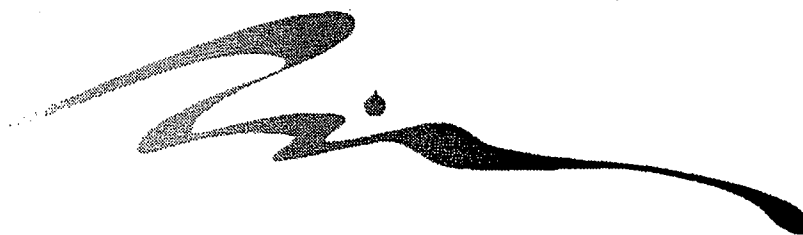
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Mark Hodgson – *Clayton Group, Edison, NJ (IWC-01-31)*  
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*Discussion Leader:* Doug Dewitt-Dick – *Ashland Specialty Chemical Co., Portland, TX*

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*Session Chair:* Doug Dewitt-Dick, *Ashland Specialty Chemical Co., Portland, TX*  
*IWC Representative:* Andrew Calderwood – *Westinghouse Electric Co, LLC, Madison, PA*  
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*Discussion Leader:* Jeff McBride – *Aqua Turbo, Springdale, AK*

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*Session Chair:* Kenneth Kozelski – *DuPont Engineering Technology, Camden, SC*  
*IWC Representative:* Alan Smith – *ONDEO Nalco Chemical Company, Pittsburgh, PA*  
*Discussion Leader:* Arthur Freedman – *Arthur Freedman Associates, Inc.*

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Young I. Cho – *Drexel University, Philadelphia, PA* (IWC-01-52)  
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*The Conference on Industrial Water*

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## **LEGIONNAIRES DISEASE CONTROL - EMERGING TECHNOLOGIES, PART 1**

*Session Chair:* Wayne C. Micheletti, *Wayne C. Micheletti Inc., Charlottesville, VA*

*Discussion Leader:* William McCoy, PhD, *ONDEO Nalco Company, Naperville, IL*

*IWC Representative:* Alan Smith, *Consultant, Pittsburgh, PA*

### **Strategies For Effective Control Of Surface-Associated Microorganisms: A Literature Perspective**

CHRISTOPHER J. NALEPA and JONATHAN HOWARTH, Albemarle Corporation, Baton Rouge, LA  
IWC-02-01

### **New And Emerging Technologies for Legionella Control: A Multi-Step Approach To Evaluating Efficacy**

JANET E. STOUT, PHD, VA Medical Center, Pittsburgh, PA  
IWC-02-02

**Prepared Discussion By:** RICHARD D. MILLER, PHD, University of Louisville, Louisville, KY

### **Practical Experience With Legionella Bacteria Control In Commercial HVAC Systems**

IRVIN J. COTTON and ARTHUR J. FREEDMAN, PHD, Arthur Freedman Associates, Inc., East Stroudsburg, PA  
IWC-02-11

## **ION EXCHANGE: CONDENSATE POLISHING**

**Session Chair:** Steven Najmy, *Dow Chemical Company, Midland, MI*  
**Discussion Leader:** Richard Hetherington, *Epicor Incorporated, Linden, NJ*  
**IWC Representative:** Angela Wheland, *Sybron Chemicals Inc., a Bayer Company, Pittsburgh, PA*

### **Improved Condensate Resin Performance Using Post-Manufacturing Processing**

PETER A. YARNELL, Graver Technologies, Inc., Glasgow, DE  
IWC-02-04

### **Operation of Powdered Resin Units At High Temperature**

PHILLIP J. D'ANGELO, Jordan Technologies, Glen Mills, PA and J. STUART BROWN, Liquid Six, Inc., York, ME  
IWC-02-05

**Prepared Discussion By:** BRUCE A. LARKIN, Black & Veatch Corporation, Kansas City, MO

### **Development Of 14% Crosslinked Strong Acid Cation Gel Resin**

TAKESHI IZUMI, MASAHIRO HAGIWARA, TAKAO INO, and TOSHI TAKAI, Ebara Corporation, Japan; MARVIN H. TEGEN, The Dow Chemical Company, USA; and MASAHIKO ENDO and NAOKI BESSHO, Dow Chemical Japan Limited, Japan  
IWC-02-06

**Prepared Discussion By:** SALLY FISHER, Puricon Inc., Malvern, PA

## **COMMISSIONING GUIDELINES – PREOPERATIONAL CLEANING AND**

### **STARTUP** (*Organized by the ASME Research & Technology Committee on Water & Steam in Thermal Power Systems*)

*Session Chair:* Richard T. Jacobsen, *Bechtel BWXT Idaho, LLC, Idaho Falls, ID*

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

#### **Pre-Operational Cleaning Of Cooling Systems**

SEAN MACDONALD, CEDA Reactor, Ltd. Sherwood Park, Alberta, Canada and BRAD BUECKER, Consultant, Lawrence, KS

IWC-02-07

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#### **Pre-Operational Cleaning From The Boiler Manufacturer's Viewpoint**

KENNETH E. HANSEN, Babcock and Wilcox Company, Barberton, OH and JOHN M. JEVEC, McDermott Technology, Inc., Alliance, OH

IWC-02-08

#### **Chemical Cleaning Heat Recovery Steam Generator's (HRSG's) - Top 11 Lessons Learned**

JOHN M. SULLIVAN, HydroChem, Inc., Youngstown, OH and JOHN MCGRAW, HydroChem, Jacksonville, FL

IWC-02-09

#### **Plant Construction And Commissioning – A Manufacturer's Viewpoint of Pre-operational Cleaning**

DAVID M. SMYTH, MICHAEL RZIHA and LIAM MCLOUGHLIN, Siemens Power Generation, Erlangen, Germany; and JAMES C. BELLOWS, LANA BURL and HEATHER WASHBURN, Siemens Westinghouse Power Corporation, Orlando, FL

IWC-02-10

#### **Panel Discussion**

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## **LEGIONNAIRES DISEASE CONTROL – EMERGING TECHNOLOGIES, PART 2**

*Session Chair:* Wayne C. Micheletti, *Wayne C. Micheletti Inc, Charlottesville, VA*  
*Discussion Leader:* William McCoy, PhD, *ONDEO Nalco Company, Naperville, IL*  
*IWC Representative:* Alan Smith, *Consultant, Pittsburgh, PA*

### **Legionella Treatment Strategies: First Response and Minimization Action Plan**

LINDA RUSZNAK, KEVIN PIDANE and JOANNE KUCHINSKI, Ashland Specialty Chemical, Boonton, NJ  
IWC-02-12

**Prepared Discussion By:** ANDREW J. COOPER, ONDEO Nalco Company, Naperville, IL  
**Author's Closure:** LINDA RUSZNAK & KEVIN PIDANE, Ashland Specialty Chemical, Boonton, NJ

### **An Effective Biocide Combination Treatment Program for Cooling Water Systems**

G.A. GANZER, The Dow Chemical Company, Buckingham, PA; M.G. FREID, The Dow Chemical Company, Bound Brook, NJ; J. SUMMERFIELD, The Dow Chemical Company, Midland, MI; and B.L. KIEFER, The Keeler Company, Shillington, PA  
IWC-02-13

**Prepared Discussion By:** RADISAV D. VIDIC, University of Pittsburgh, Department of Civil and Environmental Engineering, Pittsburgh, PA

### **Case Histories on Legionnaires' Disease from Cooling Tower Systems – What was the Problem with the Water Treatment Program?**

PAUL R. PUCKORIUS, Puckorius & Associates, Inc., Evergreen, CO  
IWC-02-14

**Prepared Discussion By:** DAVID F. GEARY, D.F. Geary Consultants, LLC, Annapolis, MD

## **ION EXCHANGE: ANALYSIS & PERFORMANCE**

**Session Chair:** Ed Nace, *Rohm and Haas, Philadelphia, PA*  
**Discussion Leader:** Gregory J. Tomkovich, *Epicor Incorporated, Linden, NJ*  
**IWC Representative:** Angela Wheland, *Sybron Chemicals, Inc., a Bayer Company, Pittsburgh, PA*

### **Current Trends in Ion Exchange Operations – What the Resins are Telling Us**

WAYNE BERNAHL, W Bernahl Enterprises Ltd., Elmhurst, IL and CARL ROSSOW, ONDEO Nalco Company, Naperville, IL  
IWC-02-15

**Prepared Discussion By:** VIJAY K. PURI, Ionex Water Treatment, Inc., Pittsburgh, PA  
**Author's Closure:** WAYNE BERNAHL, W Bernahl Enterprises Ltd., Elmhurst, IL and CARL ROSSOW, ONDEO Nalco Company, Naperville, IL

### **Four Years of Operating Experience with Type III Strong Base Anion Resin**

DONALD D. DOWNEY, The Purolite Company, Kitchener, Ontario, Canada  
IWC-02-16

**Prepared Discussion By:** PHILIP W. FATULA, Sybron Chemicals, Inc., a Bayer Company, Pittsburgh, PA  
**Author's Closure:** DONALD D. DOWNEY, The Purolite Company, Kitchener, Ontario, Canada

### **Design Criteria for Selection of Ion Exchange Based RO Permeate Polishing Systems**

STEFAN HILGER, Bayer AG, Leverkusen, Germany, and PHILIP W. FATULA, Sybron Chemicals, Inc., a Bayer Company, Pittsburgh, PA  
IWC-02-17

**Prepared Discussion By:** JOSEPH F. GIANNELLI, Finetech Inc., Mountain Lakes, NJ

### **Performance Expectation of Ion Exchange Resins Under Variable Operating Conditions in a Makeup Demineralizer**

TERRENCE HELLER, The Purolite Company, Bala Cynwyd, PA  
IWC-02-18

## **EPRI BOILER WATER CHEMISTRY UPDATE**

*Session Chair:* Mike Rootham, *Mike Rootham & Associates, Delmont, PA*

*IWC Representative:* Andrew Calderwood, *Consultant, Pittsburgh, PA*

### **An Outline of the New Approach to EPRI Guidelines**

ALROY ASCHOFF, Electric Power Research Institute Consultant, and BARRY DOOLEY, Electric Power Research Institute, Palo Alto, CA

IWC-02-19

### **Renovation or Replacement of Existing Makeup Water Treatment Systems**

ROBERT D. BARTHOLOMEW, DAVID A. CLINE, JR., and GARY H. ROBERTS, Sheppard T. Powell Associates, LLC, Baltimore, MD

IWC-02-20

### **Condensate Polishing for Fossil Power Stations: A Review of Recent Work Aimed at Reducing Costs**

MICHAEL A. SADLER, Consultant, Portishead, Bristol, UK

IWC-02-21

### **Copper Transport in Fossil Utility Cycles**

KEVIN J. SHIELDS and BARRY DOOLEY, Electric Power Research Institute, Palo Alto, CA

IWC-02-22

### **Panel Discussion**

TRANSCRIPT

## **BUSINESS & MANAGEMENT TRENDS**

*Session Chair:* Dan Shannon, *Unipure Corporation, Houston, TX*  
*Discussion Leader:* Mark Cheresnowsky, *ONDEO Industrial Solutions, Richmond, VA*  
*IWC Representative:* Paul O'Boyle, *Global Water Services, Inc., Pittsburgh, PA*

### **Plant Design Considerations for Economic Use of Mobile Demineralizers**

R.T. TAYLOR, JR., Ecolochem, Inc., Norfolk, VA  
IWC-02-23

**Prepared Discussion By:** RONALD MADDEN, Res-Kem Corp., Aston, PA

### **Water Treatment and Chemical Procurement Strategies**

PAUL R. BROWN, CPM, Texas Genco, LP, Houston, TX and MICHAEL D. BAILEY, Reliant Resources Corporation, Las Vegas, NV  
IWC-02-25

### **Innovative Business Model for High Strength Refinery Waste Streams**

BOB GORGOL, JOHN SCHUBERT and STEVE HOPPER, USFilter Operating Services  
IWC-02-27

## **COOLING WATER TREATMENT – INNOVATIVE APPROACHES**

*Session Chair:* Paul Puckorius, *Puckorius & Associates, Inc., Evergreen, CO*  
*Discussion Leader:* Doug DeWitt-Dick, *Ashland Chemical Company, Portland, TX*  
*IWC Representative:* Alan Smith, *Consultant, Pittsburgh, PA*

### **Evaluating Microbial Control Treatments Using a Dual-Channel Biofouling Monitor**

WAYNE H. DICKINSON, Buckman Laboratories, Memphis, TN  
IWC-02-28

### **Development of Performance-Based Control Technology for Cooling Water Treatment**

EDWARD S. BEARDWOOD, Drew Industrial Division, Ashland Canada Corp., Ajax, Ontario, Canada; and MARK PANTAZES, Drew Industrial Division, Ashland Specialty Chemical Co., Boonton, NJ  
IWC-02-29

### **Advanced Cooling Water Performance with New Dual Functioning Inhibitor**

DANIEL A. MEIER, BARBARA E. MORIARTY, JEFFREY P. RASIMAS and DAVID L. STONECIPHER, ONDEO Nalco Company, Naperville, IL  
IWC-02-30

**Prepared Discussion By:** GARY A. LORETITSCH, Puckorius & Associates, Inc., Evergreen, CO

### **Biofilms that Control Corrosion**

THOMAS K. WOOD, University of Connecticut, Storrs, CT; BARRY C. SYRETT, Electric Power Research Institute, Palo Alto, CA; PEGGY J. ARPS and JAMES C. EARTHMAN, University of California, Irvine, CA; and FLORIAN MANSFELD, University of Southern California, Los Angeles, CA  
IWC-02-31

### **Ozone For Cooling Tower Systems – An Update and Lessons Learned At The Kennedy Space Center**

DANIEL J. TIERNEY, Space Gateway Support, Kennedy Space Center, FL  
IWC-02-32

**Prepared Discussion By:** RICHARD M. AHLGREN, Ahlgren Associates LLC, Waukesha, WI

## **MEMBRANE PROCESSES – OPERATION & MAINTENANCE ISSUES**

*Session Chair:* Wayne Bernahl, *W Bernahl Enterprises, Elmhurst, IL*

*Discussion Leader:* William Bornak, *RTI, Richboro, PA*

*IWC Representative:* Joseph Loftis, *Consultant, Pittsburgh, PA*

### **Alleviation of Problems Associated with Start-Up of RO Systems at a 480 MW Power Plant**

PHILIP K. HAZEN, Texas Municipal Power Agency, Carlos, TX and JC DROMGOOLE, Fort Bend Services, Inc., Stafford, TX

IWC-02-33

### **Membranes Operational Warning Signs, Troubleshooting, and Cleaning**

JIM SUMMERFIELD, The Dow Chemical Company, Midland, MI

IWC-02-34

### **The Impact of Monitoring and Control on Reverse Osmosis Plant Performance**

E.H.K. ZEIHHER, B. HO, and B. ANDREWS, ONDEO Nalco Company, Naperville, IL

IWC-02-35

### **Self-Cleaning Filters for Pre-Treatment of Membrane and UV Water Treatment Systems**

MARCUS N. ALLHANDS, PHD, PE, Amiad Filtration Systems, Oxnard, CA

IWC-02-36

## **WASTEWATER TREATMENT AND REUSE**

**Session Chair:** Meint Olthof, PhD, *The Advent Group, Inc., Dennisport, MA*

**Discussion Leader:** Pradeep Amin, *Duke/Fluor Daniel, Aliso Viejo, CA*

**IWC Representative:** John Schubert, *USFilter, Pittsburgh, PA*

### **Combined Cycle ACC Power Plant Zero Discharge Optimization: Design Versus Operation**

BRIAN AYLAIAN, PE, Bechtel Power Corporation, Frederick, MD

IWC-02-38

### **Reuse of Secondary Effluent in Hawaii**

ROBERT P. HELWICK, USFilter, Moon Township, PA

IWC-02-39

### **Treatment of Wastewater from Vegetable Oil Refinery and its Reuse using Upflow Anaerobic Fixed Film Fixed Bed Reactor System**

NARENDRA P. SHINKAR, Government Polytechnic, Nanded, Maharashtra, India and TAPAS NANDY, National Environmental Engineering Research Institute (NEERI), Nagpur, Maharashtra, India

IWC-02-40

### **Microsand-Ballasted Clarification Technology Provides Recycled Water for Cooling Tower Make-up To Calpine's Delta Energy Center**

BILL MOORE, Calpine Corporation, Houston, TX and WILLIAM SULLIVAN, USFilter, Cary, NC

IWC-02-41

### **Propagation of Rainbow Trout in Treated Mine Water at the Warwick Project**

LOU KOENIG, Zinkan Enterprises, Twinsburg, OH and CHARLES K. BLANKENSHIP, PE, Duquesne Light Company, Pittsburgh, PA

IWC-02-37

## **COMBINED CYCLE – PRACTICAL EXPERIENCES**

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

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

### **New Analytical Technique Promotes Elimination of Silica in Feed, Steam and Condensate Systems**

RICK DUNN, Ionics Instruments, Boulder, CO

IWC-02-42

### **Improved Chemical Treatment Program for Optimum Corrosion Control in a Combined Cycle Power Plant**

KAJ RONDUM and KEITH FIELDING, Ashland Specialty Chemical Company, Boonton, NJ

IWC-02-44

**Prepared Discussion By:** MARK A. JANICK, PE, Bechtel Power Corporation, Frederick, MD

### **Organic Water Treatment Chemicals versus Ammonia and Hydrazine**

JULIUS ISAAC, PE and KUMAR SINHA, PE, Bechtel Power Corporation, Frederick, MD

IWC-02-45

## **ADVANCES IN NON-TRADITIONAL COOLING WATER TREATMENT**

*Session Chair:* Jean Gucciardi, *Consultant, Wyncote, PA*

*Discussion Leader:* Jay Farmarie, *Cyrus Rice Water Consultants, Pittsburgh, PA*

*IWC Representative:* David McFayden, *Michael Baker Jr., Inc., Pittsburgh, PA*

### **Non-chemical Water Treatment Systems: Histories, Principles and Literature Review**

LORAIN A. HUCHLER, PE, MarTech Systems, Inc., Lawrenceville, NJ

IWC-02-46

**Prepared Discussion By:** SAMUEL B. DILCER, JR., Cyrus Rice Water Consultants, Pittsburgh, PA

### **An Investigation of Electrostatic Water Treatment for Industrial Systems**

JOHN P. COULTER, CESAR A. SILEBI, and C. ALEXIS BENNETT, Lehigh University, Bethlehem, PA; and PAUL Q. MCLAIN, Chemfree Water Systems Inc., Nazareth, PA

IWC-02-48

### **Electrochemical Evaluation of Scale Inhibitor To Cooling Systems**

JESÚS MARÍN-CRUZ and ARQUIMEDES ESTRADA, Instituto Mexicano del Petróleo México City, DF, México; and IGNACIO GONZÁLEZ, Universidad Autónoma Metropolitana, México City, DF, México

IWC-02-49

## **MEMBRANE PROCESSES – PRACTICAL APPLICATIONS**

*Session Chair:* Harold Aronovitch, *Hungerford & Terry, Inc., Clayton, NJ*  
*Discussion Leader:* Jante Johnson, *Dow Chemical Company, Eden Prairie, MN*  
*IWC Representative:* James Datesh, *Dacar Industries Incorporated, Pittsburgh, PA*

### **HERO™ Application on High Silica Gray Water for an ACC Combined Cycle Power Plant**

NANDAN T. VANI, PE, DSc, Bechtel Corporation, Frederick, MD; JOEL KASPER, PE, Aquagenics Inc., Woburn, MA;  
and CHRIS REGA, InterGen Energy, Burlington, MA  
IWC-02-50

**Prepared Discussion By:** PETER ERIKSSON, Osmonics, Vista, CA

### **Dissolved Oxygen Reduction by Membrane Technology to Reduce Feed Water System Corrosion**

RICHARD M. MODE, Ecolochem, Inc., St. Peters, MO; WILLIAM E. HAAS, Ecolochem, Inc., Norfolk, VA; and  
WENDELL GREENE, Southern Company, Roopville, GA  
IWC-02-52

## **BOILER FEEDWATER CONTAMINATION**

*Session Chair:* James Robinson, *GE Betz, Trevose, PA*

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

### **Operating To Prevent Feedwater Contamination**

ROBERT HOLLOWAY, Holloway Associates, Etobicoke, Ontario, Canada

IWC-02-53

### **A Multi-Parameter Instrument Approach to Boiler Feedwater Monitoring**

DAVID M. GRAY, Thornton/Mettler-Toledo, Waltham, MA

IWC-02-54

### **The Impact of Water Chemistry on Boiler Tube Failures**

MEL J. ESMACHER, PE and JOHN F. FARRARO, PE, GE Betz, The Woodlands, TX

IWC-02-55

### **Responding to Boiler Feedwater Contamination**

K. ANTHONY SELBY, Water Technology Consultants™, Inc., Evergreen, CO

IWC-02-56

### **Panel Discussion**

TRANSCRIPT

## **CLEANING OF WATERSIDE FOULED SURFACES**

*Session Chair:* Ray Post, *GE Betz, Trevose, PA*

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

*IWC Representative:* Andrew Calderwood, *Consultant, Pittsburgh, PA*

### **Process for Cleaning and Self-Passivation of Surfaces Fouled with Iron Oxide Deposit**

JASBIR S. GILL, PHD, ONDEO Nalco Company, Naperville, IL

IWC-02-59

### **Beneficial Use of EPRI Chemical Cleaning Guidelines**

KEVIN J. SHIELDS and R. BARRY DOOLEY, EPRI, Palo Alto, CA

IWC-02-60

### **Chemical Cleaning of Industrial Utility Systems**

JAMES E. FARMERIE, HERC Products, Inc., Wexford, PA

IWC-02-61

## **COOLING WATER SYSTEMS – PRACTICAL OPERATIONAL CONSIDERATIONS**

*Session Chair:* Martin R. Orban, *Mitco, Inc., Grand Rapids, MI*  
*Discussion Leader:* Doug DeWitt-Dick, *Ashland Chemical Company, Portland, TX*  
*IWC Representative:* Edward Maziarz, *Alcoa, Pittsburgh, PA*

### **Proper Initial Passivation of Cooling Water Heat Exchangers – Is This A Lost Art?**

PAUL R. PUCKORIUS, Puckorius & Associates, Inc., Evergreen, CO  
IWC-02-62

### **Corrosion Monitoring Techniques For Industrial Cooling Water and Process Systems**

TZU-YU CHEN, RODNEY H. BANKS, JEFFREY BRESHEARS, NARASIMHA M. RAO, STEVEN N. NICOLICH and DANIEL M. CICERO, ONDEO Nalco Chemical Company, Naperville, IL  
IWC-02-63

### **Identifying and Minimizing Cooling Tower Mechanical and Performance Risks**

ROBERT STRANDBERG, Covanta Energy, Bainbridge, PA and TERRY MCCOY, ChemTreat, Inc., Lancaster, PA  
IWC-02-64

**Prepared Discussion By:** THOMAS W. WOLFE, Wolfe Water Treatment Services, LLC, Baton Rouge, LA

### **How a Power Plant Air Permit Can Impact the Cooling Tower Circulating Water Treatment System Design Process**

SUSAN BAINES, Bechtel Power Corporation, Frederick, MD  
IWC-02-65

### **An Integrated Approach to the Evaluation of Chemical Treatment Programs for Full Scale Cooling System Applications, With the Emphasis On The Reduction of Total Cost of Ownership**

W.D. SAUNDERS, Sasol Technology (Pty) Ltd, Secunda, South Africa; S.E. WILKENS, Buckman Laboratories (Pty) Ltd, Bedfordview, South Africa; and A PALAZZO, Buckman Laboratories (Pty) Ltd, Hammarsdale, South Africa  
IWC-02-66

**Prepared Discussion By:** WAYNE C. MICHELETTI, Wayne C. Micheletti, Inc., Charlottesville, VA  
**Author's Closure:** W.D. SAUNDERS, Sasol Technology (Pty) Ltd, Secunda, South Africa; S.E. WILKENS, Buckman Laboratories (Pty) Ltd, Bedfordview, South Africa; and A PALAZZO, Buckman Laboratories (Pty) Ltd, Hammarsdale, South Africa



*The Conference on Industrial Water*

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#### 64<sup>th</sup> ANNUAL MEETING

OCTOBER 19-23, 2003

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## ION EXCHANGE SESSION– PACKED BED FORUM

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

*Discussion Leader:* Richard Hetherington, *Epicor, Inc., Ft. Washington, PA*

*IWC Representative:* Andrew Calderwood, *Pittsburgh, PA*

### **Modernization Concepts; Utilizing Bayer Countercurrent Packed Bed Technology**

DAVID T. DALLY, Sybron Chemicals, Inc., A Bayer Co., Birmingham, NJ, DARIN CUNNINGHAM & PAUL W. GROSS, Liquid Process Technologies, Houston, TX

**IWC-03-04**

**Prepared Discussion By:** DAN RICE, Dow Chemical Co., Midland, MI

### **The Application of CADIX (Computer Aided Design for Ion exchange) to Predict the Performance Advantages of an UPCORE Technology Retrofit for a Make-up Water Demineralizer**

RICK MULLIGAN, Dow Chemical Canada, Inc., Sarnia, Ontario, Canada and STEPHEN NAJMY, The Dow Chemical Company, Midland, MI

**IWC-03-05**

## **REDUCING WASTE SESSION – SPONSORED BY THE WATER QUALITY ASSOCIATION**

*Session Chair/Discussion Leader:* Mark V. Rowzee, *Water Quality Association, Lisle, IL*  
*IWC Representative:* Angela Wheland, *Bayer Chemicals Corporation, Pittsburgh, PA*

### **Membrane Separation Technologies for Industrial Water Reuse**

PETER S. CARTWRIGHT, PE, Cartwright Consulting Co., Minneapolis, MN

**IWC-03-06**

**Prepared Discussion By:** WAYNE E. BERNAHL, W Bernahl Enterprises Ltd, Elmhurst, IL

### **The Use of Portable Exchange Deionization Services in the Power Industry**

WILLIAM KOEBEL, ResinTech, Inc., West Berlin, NJ

**IWC-03-07**

**Prepared Discussion By:** DAVE CHRISTOPHERSON, Crown Solutions, Dayton, OH

## MEMBRANES SESSION – SYSTEM DESIGN, OPERATION AND CLEANING

*Session Chair:* Vijay Puri, *Ionex Water Treatment, Inc., Ingomar, PA*  
*Discussion Leader:* Paul Lavery, *Membrane Systems Corporation, San Diego, CA*  
*IWC Representative:* Paul O'Boyle, *Marley Cooling Technologies, Pittsburgh, PA*

### **Cost Effective RO & NF Systems: Importance of O&M Considerations in Design, Procurement, and Manufacturing**

JULIA E. NEMETH, PE, Harn R/O Systems, Inc., Venice, FL and THOMAS F. SEACORD, P.E., Carollo Engineers, Boise, ID

**IWC-03-14**

**Prepared Discussion By:** HARBANS KOHLI, US Filter Corporation, Signal Hill, CA

### **Utilizing Reverse Osmosis to Recover Waste Water from a High Purity Water Treatment System**

JOHN E. KRISTENSEN, Entergy Nuclear, Buchanan, NY and SCOTT B. GORRY, Ecolochem, Inc., East Hartford, CT

**IWC-03-15**

**Prepared Discussion By:** JEFF TATE, Omexell, Inc., Hatfield, PA

## ULTRAFILTRATION TECHNOLOGY & APPLICATIONS SESSION

**Session Chair:** William E. Bornak, *Aqueous Solutions / RTI, Richboro, PA*

**Discussion Leader:** William S. Miller, *Ecolochem, Inc., Norfolk, VA*

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

### **A Step-Change Improvement in Melt-Blown Depth Filtration Technology**

DAVE PAULSON, BILL LAIDLAW, MIKE MADSEN, and JOE SZCZEPANSKI, GE Osmonics, Minnetonka, MN

**IWC-03-01**

**Prepared Discussion By:** PETER F. METCALFE, Toray Membrane America, San Diego, CA

### **Ultrafiltration as Pretreatment to Reverse Osmosis**

MERRILEE GALLOWAY, ANTONIA VON GOTTBURG, SCOTT WHITAKER, Ionics, Inc., Watertown, MA

**IWC-03-02**

**Prepared Discussion By:** RICHARD FRANKS, Hydranautics, Inc., Oceanside, CA

### **RO Pretreatment with Immersed Hollow Fiber Ultrafiltration**

GLENN P. VICEVIC and SUSAN GUIBERT, ZENON Environmental, Oakville, Ontario, Canada , RICKY BRYANT, Southern Company, Atlanta, GA, JOHN PAPANIA and ALAN WHITLEY, Mississippi Power Company, Escatawpa, MS

**IWC-03-03**

# **PANEL DISCUSSION SESSION : ASME RESEARCH COMMITTEE ACTIVITIES AND PROJECTS**

**Session Chair:** Richard Jacobsen, *Bechtel BWXT Idaho, Idaho Falls, ID*  
**IWC Representative:** David Simon, *Cyrus Rice Water Consultants, Pittsburgh, PA*

## **Introduction to the ASME Research and Technology Committee on Water and Steam in Thermal Systems**

JAMES O. ROBINSON, GE Betz, Trevose, PA  
**IWC-03-08**

## **The Costs of Improper Power Cycle Lay-up and How They May Be Avoided**

ROBERT HOLLOWAY, Holloway Associates, Etobicoke, Ontario, Canada  
**IWC-03-09**

## **Sampling and Monitoring Of Feedwater and Boiler Water Chemistry**

IRVIN J. COTTON, Arthur Freedman Associates, Stroudsburg, PA and ROGER LIGHT, The Dow Chemical Co., Freeport, TX  
**IWC-03-10**

## **Operating Guidelines for HRSG Cycle Chemistry - Status Report on the HRSG Limits Task Group**

DAVID G. DANIELS, M&M Engineering, Austin, TX  
**IWC-03-11**

## **Amine Use in Steam Water Cycles and Boilers - The State of Our Knowledge**

MICHAEL W. ROTHAM, Mike Rootham and Associates, Delmont, PA, J.C. BELLOWS, Siemens Westinghouse, Orlando, FL, D.M. BLOOM, Odeco-Nalco Company, Wheaton, IL, and J.O. ROBINSON, GE Betz, Trevose, PA  
**IWC-03-12**

## **Pre Commissioning of Combined Cycle Plants**

EDWARD S. BEARDWOOD, Drew Canada Division of Ashland Canada Corp., Ajax, Ontario, Canada  
**IWC-03-13**

## **Panel Discussion Transcript**

There is no accurate written transcript available due to poor quality of the recording and the presence of background noise. Audio tapes of the recording available. If you would like a copy, please complete the order form noted below:

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## ADVANCES IN WASTEWATER RECLAMATION SESSION

*Session Chair:* Lou Koenig, Zinkan Enterprises, Twinsburg, OH  
*Discussion Leader:* Charles Blankenship, Duquesne Light, Pittsburgh, PA  
*IWC Representative:* John Schubert, USFilter, Moon Township, PA

### **Eight Years of Secondary Waste Reuse In Power Production**

CHUCK DALE, Ionics Incorporated, San Jose, CA

**IWC-03-17**

**Prepared Discussion By:** DON BOUDREAU and DAWN GUENDERT, USFilter, Plainfield, IL

### **Microfiltration System Treats Secondary Sewage at Eraring Power Station**

GARRY CRAIG, Eraring Energy, Dora Creek, NSW, Australia

**IWC-03-18**

**Prepared Discussion By:** KUMAR SINHA, Bechtel Power Corp., Frederick, MD

### **Commissioning Challenges for a Water Treatment Plant Designed to Treat and Reuse Gray Water in Baja California**

KUMAR JAIN, Fluor Daniel, Inc., Aliso Viejo, CA, ANGELO O. CANALES RUBIO, Agua Process, Veronica Anzures, Mexico, and LUCINA O. EQUIHUA ALBARRAN, Ondeo Degremont, Mexico City, Mexico

**IWC-03-19**

### **Monitoring of Organics Removal In High Purity Water Production From Reclaimed Sewage**

BALAKRISHNAN VISWANATH, KIRAN KEKRE, and GUIHE TAO, PHD Centre for Advanced Water Technology, (A Division of Singapore Utilities International, Singapore)

**IWC-03-20**

## COOLING WATER SESSION – INNOVATIVE TREATMENT AND CLEANING APPLICATIONS FOR OPEN AND CLOSED SYSTEMS

**Session Chair:** Jasbir Gill, PhD, *ONDEO Nalco, Naperville, IL*  
**Discussion Leader:** Paul Puckorius, *Puckorius & Associates, Inc., Evergreen, CO*  
**IWC Representative:** Alan Smith, *Consultant, Pittsburgh, PA*

### **The On-line Removal of Inorganic Foulants and Conversion to a State of the art Alkaline Cooling Water Treatment Program at an Independent Power Producer**

GEORGE J. MINCAR, Ashland Specialty Chemical, Boonton, NJ, BRIAN R. DAVIDSON, Ashland Specialty Chemical, Cranberry Township, PA and JOHN R. ROBSON, Piney Creek LP, Clarion, PA

**IWC-03-21**

**Authors Closure By:** GEORGE J. MINCAR, Ashland Specialty Chemical, Boonton, NJ, BRIAN R. DAVIDSON, Ashland Specialty Chemical, Cranberry Township, PA and JOHN R. ROBSON, Piney Creek LP, Clarion, PA

### **Chemical vs. Non-chemical Cooling Water Treatments - a Side-by-Side Comparison**

KEVIN A. KITZMAN and EDWARD F. MAZIARZ, Alcoa, Inc., Pittsburgh, PA, ALAN SMITH, Consultant, Pittsburgh, PA, CHARLES D. BLUMENSCHEN, P.E., DEE, USFilter, Pittsburgh, PA, and BOBBY J. PADGETT, Alcoa, Goose Creek, SC

**IWC-03-22**

**Prepared Discussion By:** ARTHUR J. FREEDMAN, PhD., Arthur Freedman & Associates, Inc., East Stroudsburg, PA

### **New Stable Biodegradable Scale Inhibitor Formulations For Cooling Water: Development and Field Tests**

MATTHIAS SCHWEINSBERG, W. HATER, and J. VERDES, Henkel KGaA, Dusseldorf, Germany

**IWC-03-23**

## CHALLENGES AND INNOVATIONS IN WATER REUSE SESSION

*Session Chair/Discussion Leader:* Richard Hetherington, Epicor, Inc., Ft. Washington, PA  
*IWC Representative:* David McFayden, P.Eng., Michael Baker Jr., Inc., Coraopolis, PA

### **Utilizing Mine Water for Aquaculture**

KENNETH J. SEMMENS and DANIEL MILLER, West Virginia University, Morgantown, WV  
**IWC-03-24**

### **Advanced Environmental Efforts in Treating Cooling Water Systems in the Hydrocarbon and Chemical Process Industries**

LAWRENCE HALE, Drew Ameroid Singapore, Ashland Speciality Chemical Co, Jurong, Singapore  
**IWC-03-25**

### **Challenges in Managing Reclaimed Water Quality: Perspectives from the Supplier and End-User**

DAN ROBINETTE, CH2M Hill, Englewood, CO, RICH D'AMATO, CH2M Hill, Charlotte, NC, and BOB HOLDEN, Monterey Regional Water Pollution Control Agency, Monterey, CA  
**IWC-03-26**

### **New Process For Reusing Produced Wastewater**

CRAIG J. BROWN, Eco-Tec, Inc., Pickering, Ontario, Canada, GUIHALI LI, Huayi Environmental Engineering Co., Ltd., Panjin, Liaoning, China, ADRIAAN VAN DER BEEK, Nijhuis Water Technology, Inc., Richmond Hill, Ontario, Canada, and JON H. XIAO, Andmir Environmental Hi-Tech Inc., Toronto, Ontario, Canada  
**IWC-03-27**

## **RO MEMBRANES SESSION – NEW TECHNOLOGIES AND APPLICATIONS**

*Session Chair:* Wayne E. Bernahl, *W Bernahl Enterprises Ltd., Elmhurst, IL*  
*Discussion Leader:* Jantje Johnson, *Film Tec Corp. - The Dow Chemical Company, Edina, MN*  
*IWC Representative:* Joseph Loftis, *Pittsburgh, PA*

### **Economy of Scale: Large Membrane Modules for Degasification & Purification**

AMIT SENGUPTA, BETH KITTERINGHAM, and CHARLES J. RUNKLE Membrana-Charlotte, Charlotte, NC  
**IWC-03-28**

**Prepared Discussion By:** PETER S. CARTWRIGHT, PE, Cartwright Consulting Co., Minneapolis, MN

### **Optimizing the Performance of an RO System Containing the Newest Generation of Low Pressure RO Membranes**

RICHARD N. FRANKS, Hydranautics, Oceanside, CA  
**IWC-03-29**

**Prepared Discussion By:** GLENN VICEVIC, Zenon Environmental Systems, Oakville, Ontario, Canada

### **Meeting Semiconductor Fab Quality With Mobile Equipment**

ROBERT A. ESCOBEDO and JUDY PUCKETT, Ecolochem, Inc., Norfolk, VA  
**IWC-03-48**

## COOLING WATER SESSION – I & A

*Session Chair/Discussion Leader:* Douglas B. Dewitt-Dick, *Ashland Specialty Chemical Company, Portland, TX*  
*IWC Representative:* Fred Potthoff, *Kroff Chemical Company, Pittsburgh, PA*

### **Metallurgical Examination of Cooling Water Equipment Failures**

STEPHEN M. MCINTYRE and DUNN JOSEPH HOFILINA, *Ashland Specialty Chemical Co. – Drew Industrial Div., Boonton, NJ*, and DOUGLAS B. DEWITT-DICK, *Ashland Specialty Chemical Co., Portland, TX*  
**IWC-03-30**

### **Part per Billion (µg/L) Determination of Chlorine in Cooling Water Discharge and Feed Water**

RICHARD W. PRESLEY, *Hach Company, Loveland, Co*  
**IWC-03-31**

### **An Innovative Approach To High Rate Softening**

CHARLES D. BLUMENSCHN, P.E. DEE, KASHI BANERJEE, PH.D., P.E., DEE, MARK DI NARDO, and ERICA BLUMENSCHN, *USFilter - North American Technology Center, Pittsburgh, PA*  
**IWC-03-47**

**Prepared Discussion: By J.C. Dromgoole, Fort Bend Services, Inc., Stafford, Texas, USA**

## **DESIGN AND MAINTENANCE OF STEAM SYSTEMS SESSION**

**Session Chair:** Kumar Sinha, *Bechtel Power, Frederick, MD*

**Discussion Leader:** Kenneth J. Kallfisch, *Washington Group International, Princeton, NJ*

**IWC Representative:** Andrew Calderwood, *Pittsburgh, PA*

### **The Application of Simulation and Diagnostic Systems to Water Treatment In Power Plants and Industrial Steam Cycles**

PETER J. MILLETT, JOSEPH D. BATES, and DENNIS F. HUSSEY, *iSagacity, Half Moon Bay, CA*

**IWC-03-32**

**Prepared Discussion By:** OTAKAR JONAS and LEE MACHEMER, *Jonas, Inc., Wilmington, DE*

### **From Raw Water Analysis to Steam Purity - Challenges and Solutions**

JULIUS ISAAC, LAWRENCE GASPER, and KUMAR SINHA *Bechtel Power Corporation, Frederick, MD*

**IWC-03-33**

**Prepared Discussion By:** JAMES C. BELLOWS, *Siemens Westinghouse, Orlando, FL*

### **Chemical Cleaning A Boiler - An Overview**

MO D. MAJNOUNI, *Aramco Services Company, Houston, TX* and ARIF E. JAFFER, *Baker Petrolite Corporation, Sugar Land, TX*

**IWC-03-34**

**Prepared Discussion By:** MARK A. JANICK, P.E., *Bechtel Power Corp., Frederick, MD*

## **EDI SYSTEMS SESSION – TECHNOLOGY & EXPERIENCE**

**Session Chair:** William E. Bornak, *Aqueous Solutions / RTI, Richboro, PA*

**Discussion Leader:** William S. Miller, *Ecolochem, Inc., Norfolk, VA*

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

### **Basis for Characterization of Performance of EDI Devices**

JOHN H. BARBER and DAVID F. TESSIER, E-Cell Corporation, Guelph, Ontario, Canada

**IWC-03-35**

### **Improvement in Power Plant Water Quality Utilizing EDI: Case Studies at Two New Power Plants**

TED PRATO, Ionics, Inc., Watertown, MA, BRIAN AHEARN, Maine Independence Power, and JEFF PURVIS, Hinds Energy

**IWC-03-36**

**Prepared Discussion By:** CHERYL G. SAWYER, Cogentrix, Suffolk, VA

### **Field Experience with New CEDI Module Design**

JONATHAN WOOD, US Filter, Lowell, MA, DENNIS BLACKBOURN, Wisconsin Power & Light, Cassville, WI, and ERIN WESTBERG, Alliant Energy, Cedar Rapids, IA

**IWC-03-37**

# **INTEGRATED WATER MANAGEMENT TO ACHIEVE ZERO LIQUID DISCHARGE SESSION**

*Session Chair:* Wayne C. Micheletti, *Wayne C. Micheletti, Inc., Charlottesville, VA*  
*Discussion Leader:* Thomas J. Feeley, III, QEP, *U.S. Dept. of Energy- Nat'l. Energy Tech. Lab., Pittsburgh, PA*  
*IWC Representative:* Edward Maziarz, *Alcoa, Pittsburgh, PA*

## **Nanofiltration Followed by Reverse Osmosis of Cooling Water Blowdown to Achieve Zero Liquid Discharge**

PETER K. ERIKSSON, GE Osmonics, Vista, CA, IAN SCARTH, GE Betz, Regina, SK, Canada and WILLIAM K. TAYLOR, Saskferco Products, Inc., Belle Plaine, SK, Canada

**IWC-03-38**

**Prepared Discussion By:** WILLIAM MOORE, Calpine, Houston, TX

## **Process Selection for Power Plant ZLD Systems**

CHARLES H. FRITZ and MICHAEL C. PRESTON, Black & Veatch Corporation, Overland Park, KS

**IWC-03-39**

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

**Authors Closure By:** CHARLES H. FRITZ and MICHAEL C. PRESTON, Black & Veatch Corporation, Overland Park, KS

## **Integrated Approach to Water/Wastewater Treatment at a Zero Discharge, Combined Cycle Power Plant**

DAVE CISZEWSKI, Ionics RCC, Bellevue, WA

**IWC-03-40**

**Prepared Discussion By:** RONALD D. NEUFELD, PhD, University of Pittsburgh, Pittsburgh, PA

## TARGETING CONTAMINANTS SESSION – PROCESS AND WASTE STREAMS

*Session Chair/Discussion Leader:* James Dromgoole, *Fort Bend Services, Stafford, TX*

*IWC Representative:* Mark Cheresnowsky, *Consultant, Gloucester, VA*

### **Boron Removal with Ion Exchange Resin**

DONALD D. DOWNEY, The Purolite Company, Kitchener, Ontario, Canada and MICHAEL WUNSCH, Ondeo Industrial Solution GmbH (Degremont), Stuttgart, Germany

**IWC-03-41**

### **THM Destruction by UV/Ozone in RO Permeate to Facilitate Removal Downstream by Ion Exchange**

JASON P. BUFE, Ecolochem, Inc., East Hartford, CT

**IWC-03-42**

### **Arsenic Reduction From a Contaminated Cooling Tower Basin**

BILL SAULSBERRY, Ecolochem, Inc., Baytown, TX and RICHARD M. MODE, Ecolochem, Inc., St. Peters, MO

**IWC-03-43**

**Prepared Discussion By:** JAMES DROMGOOLE, Fort Bend Services, Inc., Stafford, TX

## **FEEDWATER TREATMENT SESSION**

*Session Chair:* Deborah Bloom, *ONDEO Nalco Company, Naperville, IL*  
*Discussion Leader:* James Robinson, *GE Betz, Trevose, PA*  
*IWC Representative:* David Simon, *Cyrus Rice Water Consultants, Pittsburgh, PA*

### **15 years of Crud, Corrosion, and Oxygen Control using Carbohyrazide in Boiler Feedwater at a 480 MW Power Plant**

PHILIP K. HAZEN, Texas Municipal Power Agency, Bryan, TX and VANCE LUMME, Ondeo Nalco, Houston, TX  
**IWC-03-44**

**Prepared Discussion By:** K. ANTHONY SELBY, Water Technology Consultants, Inc., Evergreen, CO

### **Troubleshooting Water Treatment Systems**

MARK A. JANICK, PE, ALLAN FARBER, and P. KUMAR SINHA, Bechtel Power Corporation, Frederick, MD  
**IWC-03-45**

**Prepared Discussion By:** DAVID G. DANIELS, M&M Engineering, Austin, TX

### **Does Your Deaerator Really Work?**

JACK B. PRATT, SIP Consultants, Inc. - Consultant to Altair Equipment Co., Inc., Ft. Worth, TX and ORIN HOLLANDER, PH.D., Holland Technologies, Inc., Jamison, PA  
**IWC-03-46**

**Prepared Discussion By:** Robert Holloway, Holloway Associates, Etobicoke, Ontario, Canada



*The Conference on Industrial Water*

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#### 65<sup>th</sup> ANNUAL MEETING

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# **Legionella — An Update on Risk Assessment, Control Technologies and Remediation of Infected Water Systems, Part I**

*Session Chair:* Wayne Micheletti, Wayne C. Micheletti, Inc., Charlottesville, VA

*IWC Representative:* Alan Smith, Consultant, Pittsburgh, PA

*Discussion Leader:* Janet Stout, PhD., Pittsburgh VA Healthcare System, Pittsburgh, PA

## **Risk Assessment: The Essential First Step in Legionellosis Risk Reduction**

ANDREW COOPER, HOWARD BARNES, NOEL CHRISTOPHER, THOMAS LINDLEY, ERIC MYERS, Nalco Company Water and Core Technologies and Environmental Hygiene Services, Naperville, IL  
IWC-04-01

**Prepared Discussion By:** ARTHUR J. FREEDMAN, PH.D., Arthur Freedman Associates, Inc., East Stroudsburg, PA

## **Cooling Tower Water Systems and Legionnaires' Disease: Lessons Learned from Recent USA Incidents and Outbreaks and the Corrective Actions That Should Be Taken**

PAUL R. PUCKORIUS, Puckorius & Associates, Inc., Evergreen, CO  
IWC-04-02

**Prepared Discussion by:** CHRISTOPHER J. NALEPA, Ph.D., Albemarle Corporation, Baton Rouge, LA

## **Wastewater Solutions Innovative Treatments for Unique Problems**

*Session Chair:* Devesh Sharma, Aquatech International Corp., Canonsburg, PA

*IWC Representative:* John Schubert, EnCOSS, Monroeville, PA

*Discussion Leader:* Mark Janick, Bechtel Power Corporation, Frederick, MD

### **Mobile Wastewater Treatment Helps Remediate Highly Concentrated Acidic Pond Water at Piney Point Fertilizer Plant, Florida**

BILL PERPICH JR., USFilter, Tampa, FL; CHRIS SOULE, USFilter, Schaumburg, IL; SAM ZAMANI, P.E., Florida Department of Environmental Protection, Phosphate Management, Tampa, FL; LOUIS TIMCHAK, Attorney, Lutz, FL; GARY UEBELHOER, Environmental Consulting & Technology, Tampa, FL; LNSP NAGGHAPPAN, ROBERT HELWICK, Veolia Water Systems, Pittsburgh, PA  
IWC-04-04

**Prepared Discussion by:** COLLEEN M. KULICK, Parsons E & C, Reading, PA

### **Phased Municipal Sewage/Sludge Stabilization**

GODEFROID BUKURU, JIAN YANG, Tongji University, Shanghai, China  
IWC-04-05

**Prepared Discussion by:** LEE A. LUNDBERG, Veolia Water, Moon Township, PA

## **Current Pretreatment Technologies for the Improvement of Industrial Water Processes**

*Session Chair:* Vijay Puri, Ionex Water Treatment, Inc., Ingomar, PA

*IWC Representative:* Wayne Bernahl, W. Bernahl Enterprises Ltd., Elmhurst, IL

*Discussion Leader:* William Willersdorf, USFilter, Bridgewater, NJ

### **Dissolved Air Flotation: A Proven Technology Making Inroads in Industrial Clarification**

WILLIAM E. HAAS, Ecolochem, Inc., An Ionics Company, Norfolk, VA; ADRIAAN VAN DER BEEK, Nijhuis Water Technology, Richmond Hill, Ontario, Canada; GREG BARTLEY, TVA, Nashville, TN  
IWC-04-06

**Prepared Discussion by:** MARK JANICK, Bechtel Power Corporation, Frederick, MD

### **High Rate Compressible Media Filtration**

WILLIAM D. KUNZMAN, Schreiber LLC, Trussville, AL  
IWC-04-07

**Prepared Discussion by:** MICHAEL C. PRESTON, Black & Veatch Corporation, Overland Park, KS

### **Hollow Fiber UF Pilot Testing Procedures & Case Studies**

DAVE CHRISTOPHERSEN, CROWN Solutions, Inc., Vandalia, OH  
IWC-04-08

**Prepared Discussion by:** JERRY ALEXANDER, USFilter, La Canada, CA

### **The Use of Short Bed Ion Exchange Technology for the Production of High Purity Water at WE Energies' Pleasant Prairie Power Plant**

MICHAEL SHEEDY, Eco-Tec Inc., Pickering, Ontario, Canada; PETER G. KUTZORA, We Energies, Fossil Operations, Milwaukee, WI  
IWC-04-09

**Prepared Discussion by:** AL NEBRIG, Southern Company Services, Hoover, AL

## **Legionella — An Update on Risk Assessment, Control Technologies and Remediation of Infected Water Systems, Part 2**

**Session Chair:** Wayne Micheletti, Wayne C. Micheletti, Inc., Charlottesville, VA

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

**Discussion Leader:** Janet Stout, PhD., Pittsburgh VA Healthcare

### **Developing a JCAHO Program and Action Manual for Legionella**

JAY FARMERIE, Cyrus Rice Water Consultants, Inc., Pittsburgh, PA

IWC-04-10

**Prepared Discussion by:** MATTHEW R. FREIJE, HC Information Resources, Fallbrook, CA

### **Evaluation of Chlorine Dioxide in Potable Water Systems for Legionella Control in an Acute Care Hospital Environment**

GREGORY BOVA, The Johns Hopkins Hospital, Baltimore, MD, TIM KEANE, Legionella Risk Management, Chalfont, PA, PAUL SHARPE, Water Chemical Service, Inc., Aberdeen, MD

IWC-04-11

**Prepared Discussion by:** MARK HODGSON, Clayton Environmental, Edison, NJ

**Author's Closure by:** GREGORY BOVA, The Johns Hopkins Hospital, Baltimore, MD, TIM KEANE, Legionella Risk Management, Chalfont, PA, PAUL SHARPE, Water Chemical Service, Inc., Aberdeen, MD

### **Chlorine Dioxide for Legionella Control in a Hospital Water System: Monitoring for Disinfection By-Products**

ZHE ZHANG, RADISAV D. VIDIC, PH.D., University of Pittsburgh - School of Engineering, Pittsburgh, PA, RAYMOND BISSON, ROBERT E. HAWKS, CAROLE MCCANN, JAMES MCELROY, STEVE PIESCZNSKI, Mercy Hospital, Buffalo, NY, JANET STOUT, PH.D., Pittsburgh VA Healthcare System, Pittsburgh, PA

IWC-04-12

### **Legionnaires' Disease: Where are we After 27 Years of Study?**

BRIAN G. SHELTON, MPH, PathCon Laboratories, Norcross, GA

IWC-04-13

## **Sustainable Development**

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

*IWC Representative:* Hermann Sicius, Lanxess Corporation, Pittsburgh, PA

*Discussion Leader:* Lou Koenig, Zinkan Enterprises, Inc., Twinsburg, OH

### **Effective Dust Suppression on a Matured Fine Ash Dam Utilizing Excess Mine Water**

JOEY SWART, Water & Environmental Research, Sasol Technology R&D, Sasol, South Africa

IWC-04-52

### **The Cost of Water in an Arid Climate: Water Conservation and Reuse —Source Segregation and Treatment**

JUSTIN R. MOSES, P.E., SCOTT A. GREICO, PE, O'Brien & Gere Engineers, Inc., Syracuse, NY

IWC-04-15

### **Water Reuse Experience in Petroleum Refineries Cooling Tower Water Systems — Lessons Learned**

PAUL R. PUCKORIUS, Puckorius & Associates, Inc., Evergreen, CO

IWC-04-16

## **Innovations in Cooling Water Treatment**

*Session Chair:* Michael Dalton, Ashland Specialty Chemical Company, Katy, TX

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

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

### **Demonstration of an On-site Electrolytic Hypobromite Generator at a Power Generation Station**

ROB LAWLER, TIMOTHY KEISTER, ProChemTech International, Inc., Brockway, PA, JEFFERY TEAGUE, Indianapolis Power and Light, Petersburg, IN

IWC-04-19

### **Zebra Mussels in an Industrial Setting: A Portable Control Option**

DAN BUTTS, ASI Group Ltd., Orchard Park, NY

IWC-04-20

**Prepared Discussion by:** RAYMOND M. POST, P.E. GE Water Process Technologies, Trevose, PA

### **On-Site Chlorine Dioxide: A Review of Uses, Safety, and New Processes**

MAREK NOWOSIELSKI, International Dioxide, Inc., A Dupont Company, North Kingstown, RI

IWC-04-21

**Prepared Discussion by:** LEONARD R. OLAVESSEN, Buckman Laboratories International, Inc., Memphis, TN

### **Non-Chemical Devices: Thirty Years of Myth Busting**

TIMOTHY KEISTER, ProChemTech International, Inc., Brockway, PA

IWC-04-22

**Prepared Discussion by:** EDWARD S. BEARDWOOD, Drew Industrial Division of Ashland Canada Corp., Ajax, Ontario, Canada

## **Wastewater Reclamation and Reuse with Membrane Bioreactors**

*Session Chair:* Charles Blumenschein, P.E., DEE, Veolia Water, Moon Township, PA

*IWC Representative:* Andrew Calderwood, Consultant, Pittsburgh, PA

*Discussion Leader:* John Schubert, P.E., EnCoss, Monroeville, PA

### **Applications of Immersed Membrane Bioreactor Technology for Advanced On-site Wastewater Treatment & Water Reuse**

JAMES HOTCHKIES, P.Eng., ZENON Environmental Inc., Oakville, Ontario, Canada

IWC-04-23

**Prepared Discussion by:** JOHN SCHUBERT, P.E., EnCoss, Monroeville, PA

### **Implementing a Zero-Discharge Wastewater Reclamation and Water Reuse System at Fallingwater**

ED FLEISCHER, CH2M Hill, Herndon, VA

IWC-04-24 (NOT AVAILABLE)

## **Current Ideas for Water Chemistry Control and Operation of HRSGs — Panel Discussion**

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

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

### **HRSG Chemistry Guidelines**

DAVID G. DANIELS, Mechanical & Materials Engineering, LLC, Austin, TX

IWC-04-26

### **Avoiding Costly Water Treatment Mistakes in Combined Cycle Power Plant Projects**

LUIS CARVALHO, P.Eng., GE Water & Process Technologies, Mississauga, Ontario, Canada

IWC-04-27

### **Heat Recovery Steam Generators-Impact of Water Chemistry**

IRVIN J. COTTON, Arthur Freedman Associates, Inc., East Stroudsburg, PA, JOHN OBERMAIER, Deltak LLC, Minneapolis, MN

IWC-04-28

### **Case History of a Heat Recovery Steam Generator System Failure**

TORRY J. TVEDT, T.J. Tvedt & Associates, Ltd, Angleton, TX

IWC-04-29 (NOT AVAILABLE)

### **Design & Operational Concerns Associated with Chemistry in HRSGs**

DOUGLAS B. DEWITT-DICK, Ashland Specialty Chemical Co., Portland, TX, EDWARD S. BEARDWOOD, Ashland Specialty Chemical Co., Toronto, Ontario, Canada

IWC-04-30

### **Panel Discussion Transcript**

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## **Cooling Water, NPDES Concerns — Current/Future Perspectives from Regulators (US EPA) and Industry**

*Session Chair:* Richard Hetherington, Epicor Incorporated, Ft. Washington, PA

*IWC Representative:* David McFayden, P.Eng., Michael Baker Jr., Inc., Coraopolis, PA

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

### **Modeling Leaching in Treated Wood Cooling Towers**

MARK A. JANICK, LAWRENCE GASPER, Bechtel Power Corporation, Frederick, MD

IWC-04-31

**Prepared Discussion by:** PAUL R. PUCKORIUS, Puckorius & Associates, Inc., Evergreen, CO

### **Technology Based Effluent Standards— What's New at EPA**

DEBORAH NAGLE, US EPA - Permits Division, Washington, DC

IWC-04-32

### **I Hear What You're Saying, But I Don't Understand a Word of It**

JOHN D. MORTON, P.E., ALCOA, Inc., Pittsburgh, PA

IWC-04-33

### **Emerging Contaminants, Regulations, and Changes for Industrial Providers of Potable Water**

MARK V. ROWZEE, Water Quality Association, Lisle, IL

IWC-04-34

# **Pros and Cons of Amine Use in Industrial and Utility Power Plants with Panel Discussion**

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

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

## **Amine Use in High Pressure Steam Cycles and Boilers**

MICHAEL W. ROTHAM, Mike Rootham & Associates, Delmont, PA

IWC-04-35

## **Hazards of Amine Use In Boiler Systems**

JAMES C. BELLOWS, Ph.D., Siemens Westinghouse Power Corporation, Orlando, FL

IWC-04-36

## **Use of Amines in HRSG Chemistry**

WILLIAM MOORE, Calpine, Houston, TX

IWC-04-37 (NOT AVAILABLE)

## **Application of a Non-Traditional Polyamine/Amine Treatment in High Pressure Drum Boiler Systems**

ALBERT BURSIK, PowerPlant Chemistry GmbH, Neulussheim, Germany

IWC-04-38

## **Panel Discussion Transcript**

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# **Membrane Systems for Use in Boiler Plants and For Potable Water Production**

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

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

*Discussion Leader:* Wayne Bernahl, W. Bernahl Enterprises, Ltd., Elmhurst, IL

## **Reverse Osmosis Operations**

JANE KUCERA, Nalco Company, Naperville, IL

IWC-04-39

**Prepared Discussion by:** KENNETH J. KOZELSKI, E.I. DuPont de Nemours, Camden, SC

## **The Use of Reverse Osmosis as a Pretreatment to a High Pressure Steam System at a Power Plant in Thailand**

MATTHEW WHITE, SIMON GARE, Ecolochem International, Ltd., Peterborough, UK, MIKE DUNHAM, Glow Power Co. Ltd, Map Ta Phut, Thailand

IWC-04-40

**Prepared Discussion by:** MICHAEL C. PRESTON, Black & Veatch Corporation., Overland Park, KS

## **Application of Membrane Filtration Technology for the Production of Drinking Water**

BENJAMIN T. ANTRIM, BRIAN M. KILCULLEN, Koch Membrane Systems, Inc., Wilmington, MA

IWC-04-41

**Prepared Discussion by:** JANTJE JOHNSON, FilmTec Corporation, Edina, MN

## **Challenges in Treating, Monitoring, & Conditioning Boiler Feedwater for Power Plants**

*Session Chair:* James Bellows, PhD., Siemens Westinghouse Power Corporation, Orlando, FL

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

*Discussion Leader:* Julius Isaac, Bechtel Power Corporation, Frederick, MD

## **Total Oxidizable Carbon Control Experience For BWR Condensate Polishing Performance**

TUNG-JEN WEN, Institute of Nuclear Energy Research, Taoyuan, Taiwan, ROC

IWC-04-42

## **pH and CO<sub>2</sub> Determinations Based on Power Plant Conductivity Measurements**

DAVID M. GRAY, Mettler-Toledo Thornton, Inc., Bedford, MA

IWC-04-43

## **Fear and Loathing at a Combined Cycle Power Plant — Ion Chromatography in a Box**

BEVERLY NEWTON, MIKE DOYLE, Dionex Corporation, Sunnyvale, CA, LUIS CARVALHO, IAN SCARTH, PEET

LINDAU, GE Water and Process Technologies, Mississauga, Ontario, Canada

IWC-04-44

## **Risk Mitigation by Managing Water Treatment System Interfaces in the Power Industry**

SUSAN BAINES, KATHI KIRSCHENHEITER, KUMAR SINHA, Bechtel Power Corporation, Frederick, MD

IWC-04-46

## **EDI: Innovative Approaches and Practical Applications**

*Session Chair:* Ed Geishecker, Consultant, Natick, MA

*IWC Representative:* Joseph Loftis, Consultant, Pittsburgh, PA

*Discussion Leader:* Jantje Johnson, FilmTec TS&D, Edina, MN

### **Process and System Design for Reliable Operation of RO/CEDI Systems**

JONATHAN WOOD, JOSEPH GIFFORD, USFilter, Lowell, MA

IWC-04-47

### **EDI Performance: Operating Results for Sites Installed at Least Five Years**

WILLIAM T. HARVEY, TED PRATO, Ionics Incorporated, Watertown, MA

IWC-04-48

**Prepared Discussion by:** CHERYL G. SAWYER, Cogentrix, Suffolk, VA

### **Introduction of Spiral Wound EDI —Exclusive Design and Its Application**

AVIJIT DEY, PH.D., GUANGHUI LI, Omexell, Inc., Houston, TX

IWC-04-51

**Prepared Discussion by:** JONATHAN WOOD, USFilter, Lowell, MA

**Author's Closure by:** AVIJIT DEY, PH.D., Omexell, Inc., Houston, TX



*The Conference on Industrial Water*

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## Produced Water & Oil-Contaminated Wastewater – Treatment & Reuse Session

**Session Chair:** Daniel Shannon, GE Water & Process Technologies, Houston, TX  
**Discussion Leader:** Devesh Sharma, Aquatech International Corp., Canonsburg, PA  
**IWC Representative:** Mark Cheresnowsky, GE Water & Process Technologies, Gloucester, VA

### **Study on Recycling Produced Water to Steam Generators and Its Field Application**

JIACAI XIE and XILIN LIU, Petrochina Liaohe Oilfield Company, Panjin, China  
IWC-05-01

**Prepared Discussion By:** GORDON PAGE, Page Technology Ltd., Calgary, Alberta, Canada  
CAROLINE WILSON, Oil Recovery, EnCana Oil and Gas Partnership, Calgary, Alberta, Canada

### **Advances in Produced Water Deoiling Utilizing a Recently Developed Technology which Removes and Recovers Dispersed Oil in Produced Water 2 Microns and Larger**

M.J. PLEBON, SERGE FRASER and MARC SAAD, EARTH (Canada) Corporation, Montreal, Quebec, Canada  
IWC-05-02

**Prepared Discussion By:** KUMAR JAIN, Flour Corporation, Calgary, Alberta, Canada  
**Author's Closure by:** M.J. PLEBON, SERGE FRASER and MARC SAAD, EARTH (Canada) Corporation, Montreal, Quebec, Canada

# Ion Exchange System Performance Improvement Session

**Session Chair:** Michael Gottlieb, ResinTech, West Berlin, NJ  
**Discussion Leader:** Dan Rice, Dow Chemical Company, Midland, MI  
**IWC Representative:** Andrew Calderwood, Consultant, Pittsburgh, PA

## **Impact of Low Molecular Weight Organic Acids on Anion Exchange Resin Kinetics**

JIM SUMMERFIELD, The Dow Chemical Company, Midland, MI  
IWC-05-03

## **Optimizing Single-use Long Life Resins**

PETER MEYERS and FRANCIS DESILVA, ResinTech, Inc., West Berlin, NJ  
IWC-05-04

**Prepared Discussion By:** FRANK CRAFT, Mobile Processing Technology, Memphis, TN

## **Use of Fractal Liquid Distribution in Water Treatment**

JAY MIERS, JR., Rohm and Haas Company, Philadelphia, PA  
IWC-05-05

**Prepared Discussion By:** CRAIG BROWN, Eco-Tec Inc., Pickering, Ontario, Canada

## **Supercritical Carbon Dioxide Extraction of Leachable Organics from IX Resins - A Novel Resin Cleaning Technique**

SHELTON DIAS, PH.D, Kinectrics, Inc., Toronto, Ontario, Canada  
IWC-05-06

**Prepared Discussion By:** WILLIAM BORNAK, RTI, Warminster, PA

## Zero Liquid Discharge in Power Plants Session

**Session Chair:** Kent Drone, HPD, Plainfield, IL  
**Discussion Leader:** Wayne Micheletti, Wayne C. Micheletti, Inc., Charlottesville, VA  
**IWC Representative:** Bradley Wolf, Veolia Water North America, Moon Township, PA

### **The Bayswater-Liddell Zero Discharge System - A 20+ Year Operational Perspective**

THOMAS BRYANT, Connell Wagner PPI, Callaghan, NSW, Australia, ERROL BURTON, Macquarie Generation, Muswellbrook, NSW, Australia, and THOMAS D. WOLFE, WaterEye Corporation, Grass Valley, CA  
IWC-05-07

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

### **Selection of Zero Liquid Discharge System - Summary of Issues at a Power Plant in California**

CHRIS LEWIS, Burbank Water & Power, City of Burbank, CA and DEVESH MITTAL, Aquatech International Corporation, Canonsburg, PA  
IWC-05-08

**Prepared Discussion By:** KUMAR SINHA, Bechtel, Frederick, MD

### **ZLD Today - Matching Water Treatment Options to Power Generating Plant Requirements**

WILLIAM MOORE, Calpine, Houston, TX and TIMOTHY RITTOF, HPD LLC, Plainfield, IL  
IWC-05-09

## International Water Challenges Session

**Session Chair:** Tarek Ghandour, Metito International Inc., Houston, TX  
**Discussion Leader:** Gomes Ganapathi, Bechtel International Systems Inc., Amman, Jordan  
**IWC Representative:** Kumar Sinha, Bechtel Power Corporation, Frederick, MD

### **Startup of Multiple Water Treatment Plants & Operator Training in Southern Iraq - A Rewarding Experience**

GOMES GANAPATHI, PH.D., CHMM, LUKE SANTEE, JASSIM AJEEL, ALI GHAREEB, OSAMA ABD AL KADIR, IMAD HADI, HASANAIN FADHIL, RAFAT MATTI, IBRAHIM KHALIL, MAHMOOD KADHIM, KHALID MAHMOOD, Bechtel International Systems Inc; SALAH SULTAN and MOHAMED YASSEN, University of Basrah, Iraq  
IWC-05-10

### **Refurbishing Power Plant Water Treatment Equipment in Iraq**

JULIUS ISAAC, PE, KATHRYN HYAM, PE, and KUMAR SINHA, PE, Bechtel Power Corporation and Bechtel Systems and Infrastructure, Inc., Frederick, MD  
IWC-05-11

### **Challenges in Rebuilding Iraq's Water Infrastructure**

MOUSTAFA HASAN, Metito (Overseas) Ltd, Amman, Jordan, and TAREK GHANDOUR, Metito International Inc., Houston TX  
IWC-05-12

### **Providing Water to the People of Sadr City, Iraq**

VIRAJ DE SILVA, PH.D., P.E., DEE and WALID HATOUM, P.E., PARSONS, Tampa, FL  
IWC-05-13

## RO Feedwater Treatment, Troubleshooting, and Equipment Maintenance Session

**Session Chair:** Jantje Johnson, The Dow Chemical Company- FilmTec Corporation, Edina, MN

**Discussion Leader:** John Bossler, US Filter, Rockford, IL

**IWC Representative:** Edward Geishecker, Consultant, Natick, MA

### **An Alternative to Silt Density Index (SDI)...Continuous Particle Counting**

ROBERT BRYANT, Chemtrac Systems, Inc., Norcross, GA

IWC-05-14

### **Membrane Filtration Improves Water Quality at Point Beach Nuclear Power Plant**

GLEN SUNDSTROM, USFilter Memcor Products, Rockford, IL and DEAN WEYENBERG, Nuclear Management Company, Two Rivers, WI

IWC-05-15

**Prepared Discussion By:** JANE KUCERA, Nalco Company, Naperville, IL

**Author's Closure by:** GLEN SUNDSTROM, USFilter Memcor Products, Rockford, IL and DEAN WEYENBERG, Nuclear Management Company, Two Rivers, WI

### **Sensitive Integrity Test for RO/NF Elements**

STEVEN JONS, PH.D., TOM HAYNES, and JAMES NATHAN, FilmTec Corporation, a subsidiary of The Dow Chemical Company, Edina, MN

IWC-05-16

**Prepared Discussion By:** STUART MCCLELLAN, Successfully Applied Membranes, Inc., Palm Beach Gardens, FL

### **Design and Operation of Large Scale Reverse Osmosis Elements and Systems**

BENJAMIN ANTRIM and CHINH HOANG, Koch Membrane Systems, Inc., Wilmington, MA

IWC-05-17

**Prepared Discussion By:** PETER MIDGLEY, Anderson Water Systems, Dundas, Ontario, Canada

### **Particle Removal Efficiency of Nano Alumina Fiber Filters**

FRED TEPPER and LEONID KALEIDIN, Argonide Corporation, Sanford, FL

IWC-05-18

## **Legionella & Biofouling Control Session**

*Session Chair/Discussion Leader:* Matthew Freije, HC Information Resources Inc., Fallbrook, CA

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

### **Environmental Effects of Electrolytically Generated Halogens for Biofouling Control**

DAVID HILL, Severn Trent DeNora, Sugar Land, TX

IWC-05-19

### **Zen and the Art of Cooling Tower Maintenance: Recognizing Ambiguity Associated with Legionella Risk Management**

CHARLES ASCOLESE, GE Infrastructure Water & Process Technologies, Trevose, PA

IWC-05-20

### **Legionella Controlled by Pulsed Power**

DAVID ALLEY and FRANK ROGERS, Clearwater Systems Corp., Essex, CT

IWC-05-21

### **Lessons Learned from Recent Outbreaks of Legionnaires Disease and Guidelines for Control in Cooling Water**

PAUL PUCKORIUS, Puckorius & Associates, Inc., Evergreen, CO

IWC-05-22

## Industrial Water and Wastewater Treatment Session

**Session Chair:** Vijay Puri, Ionex Water Treatment, Inc., Ingomar, PA

**Discussion Leader:** Allan Farber, Bechtel National Inc., Frederick, MD

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

### **Assuring Mill Reliability by Conducting Planned Audits of Water Treatment Procedures and Results**

THOMAS W. WOLFE, Wolfe Water Treatment Services, LLC, Baton Rouge, LA and JAMES KEANE, NewPage Corporation, Chillicothe, OH

IWC-05-23

**Prepared Discussion By:** VIRGINIA DURHAM, Hercules Incorporated, Philadelphia, PA

### **Case History of the Premcor Refinery Wastewater Treatment Plant on the Texas Gulf Coast**

DON VACKER and DAVID DYBELL, Bechtel Corporation, Houston, TX

IWC-05-24

**Prepared Discussion By:** SAEED DARIAN, Connestoga-Rovers & Associates, Atlanta, GA

**Author's Closure by:** DON VACKER and DAVID DYBELL, Bechtel Corporation, Houston, TX

### **Benefits of Oil and Grease Removal for Contact Cooling Water Systems in Modern Continuous Strip Process Steel Mills**

NORMAN FAHRER, ChemTreat, Inc., Glen Allen, VA, JEFF BRAUN, RUSSELL MCLAUGHLIN, Nucor Steel, Decatur, AL, and STEVE ROBSON, ChemTreat, Inc, Decatur, AL

IWC-05-25

**Prepared Discussion By:** LARRY SMITH, GE Infrastructure Water & Process Technologies, Trevose, PA

## Feed Water Conditioning/ Improving Reliability of Power Plants Session

**Session Chair:** James Bellows, Ph.D., Siemens PG, Orlando, FL  
**Discussion Leader:** Deborah Bloom, Nalco Company, Naperville, IL  
**IWC Representative:** Wayne Bernahl, W. Bernahl Enterprises Ltd., Elmhurst, IL

### **Solving Tube Failures to Improve the Boilers Reliability of the Badak's LNG/LPG Plant**

FELIX TAMPUBOLON and MUHAJIMIN, PT. Badak NGL, Bontang, East Kalimantan, Indonesia  
IWC-05-26

**Prepared Discussion By:** ANTON BANWEG, Nalco Company, Naperville, IL

### **Pilot Testing of Inside-Out UF Pretreatment Prior to RO for High Turbidity Seawater Desalination**

JINGDONG ZHANG, SUNMING GAO, YANWEI LIU, CHANGZHENG LI, CUNSONG YE, HUIMING ZEN, FANG ZHANG, Wuhan University, College of Resources & Environmental Science, Wuhan, Hubei Province, China  
IWC-05-27

### **New Oxygen Scavenger Amine Based For Boiler Feedwater Treatment**

FEDERICA PERPIGLIA, Università degli Studi di Genova - D.I.M.S.E.T., Genova, Italy  
IWC-05-28

### **The Use of Heat Tolerant Reverse Osmosis Membranes in Process Condensate Polishing**

JONATHAN HUNT, SIMON GARE, GE Water & Process Technologies, Gambia UK, MARK DUNLOP, GE Water & Process Technologies, Minnetonka, MN, PETER ERIKSSON, GE Water & Process Technologies, Vista, CA, and MATTHEW WHITE, GE Water & Process Technologies, Manila, Philippines  
IWC-05-29

**Prepared Discussion By:** SCOTT BEARDSLEY, The Dow Chemical Company, Minneapolis, MN  
**Author's Closure by:** JONATHAN HUNT, GE Water & Process Technologies, Gambia UK

## Leading Edge Technologies Session

**Session Chair:** Craig Brown, Eco-Tec Inc, Pickering, Ontario, Canada  
**Discussion Leader:** Wolfgang Hoell, Forschungszentrum Karlsruhe, Germany  
**IWC Representative:** Edward Maziarz, Alcoa, Pittsburgh, PA

### **Capacitive Deionization Technology: An Alternative Desalination Solution**

TOBIE WELGEMOED, P.E., CDT Systems, Inc., Dallas, TX  
IWC-05-30

**Prepared Discussion By:** JONATHAN WOOD, USFilter, Lowell, MA

### **Hybrid Resin Technology for Simultaneous Removal of Multiple Contaminants**

PETER MEYERS and MICHAEL GOTTLIEB, ResinTech, Inc., West Berlin, NJ  
IWC-05-31

**Prepared Discussion By:** HEIKKI MONONEN, Finex Oy, Kotka, Finland

### **Value Added Products from Innovative Applications of Donnan Membrane Principle: Two Case Studies**

ARUP SENGUPTA, PH.D., LUIS CUMBAL, and PRAKHAR PRAKASH, Lehigh University, Bethlehem, PA  
IWC-05-32

**Prepared Discussion By:** ROBERT ALBRIGHT, PH.D., Albright Consulting, Southampton, PA

### **Short-Bed Ion-Exchange Technologies for Kraft Pulp Mill System Closure**

MICHAEL PALEOLOGOU, NACEUR JEMAA, and RICHARD BERRY, Pulp and Paper Research Institute of Canada, Pointe Claire, Quebec, Canada, CRAIG BROWN and MIKE SHEEDY, Eco-Tec, Inc., Pickering, Ontario, Canada  
IWC-05-33

**Prepared Discussion By:** DAN RICE and DR. DARYL GISCH, The Dow Chemical Company, Midland, MI

### **Drawing the Line: Patentable v. Unpatentable Ideas in Water Treatment**

CLIFTON MCCANN, ESQ., Venable LLP, Washington, DC  
IWC-05-34

## Desalination Systems and Advances in Desalination Technologies Session

**Session Chair:** Robert Taylor, GE Water & Process Technologies, Norfolk, VA

**Discussion Leader:** Randy Truby, Hydranautics, Oceanside, CA

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

### **Overview of Desalination Technology**

MICHAEL PRESTON, Black & Veatch, Overland Park, KS

IWC-05-35

### **Performance Characteristics of the Diffusion Driven Desalination Process**

JAMES KLAUSNER, YI LI, and RENWEI MEI, University of Florida, Gainesville, FL

IWC-05-36

### **Pretreatment for Seawater Reverse Osmosis: Three Years Operation Of The 27.6 MIGD (125,530 M<sup>3</sup>/Day) Seawater Desalination Plant, Point Lisas, Trinidad and Tobago**

KENNETH IRWIN, PH.D., GE Water & Process Technologies, Trevose, PA and IAN RAMROOP, Desalination Company of Trinidad and Tobago, California, Trinidad

IWC-05-37

**Prepared Discussion By:** MARK JANICK, Bechtel Power Corporation, Frederick, MD

### **The Island Water Association “Case History” - Desalination of Brackish Water**

BRANDON HENKE, STEVEN DOVER, and PHILIP NOE, The Island Water Association, Inc., Sanibel, FL

IWC-05-38

### **Solar Based Distillation System for Domestic Application**

M. UMAMAHESWARAN, Anna University, College of Engineering, Chennai, India

IWC-05-39

## Advances in Wastewater Applications/ Hazardous Waste Destruction Session

**Session Chair:** Donald Vacker, Bechtel Corporation, Houston, TX

**Discussion Leader:** Bruce Larkin, Black & Veatch, Overland Park, KS

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

### **Silica Polyamine Composites: Advanced Materials for Ion Recovery and Remediation**

EDWARD ROSENBERG, DAN NIELSEN, and PAUL MIRANDA, University of Montana, Missoula, MT, and CAROLYN HART and YUCHEN CAO, Purity Systems Inc., Missoula, MT

IWC-05-40

**Prepared Discussion By:** MICHAEL GOTTLIEB, ResinTech, West Berlin, NJ

### **Use of Hydrolysis and Neutralization to Destroy Stockpiled Chemical Agents**

ALLAN FARBER and CHRISTINE TEVIS, Bechtel National Inc., Gunpowder, MD, and CRAIG HATFIELD, Battelle Memorial Institute, Aberdeen MD

IWC-05-41

### **The Ion Exchange Resource Recovery Business**

LARRY GOTTLIEB, ResinTech, West Berlin, NJ

IWC-05-43

### **Removal of Recalcitrant Organic Compounds from Stabilized Landfill Leachate Using A Hybrid of Ammonium Stripping and Gac Adsorption**

TONNI AGUSTIONO KURNIAWAN, GILBERT YS CHAN, and WAI-HUNG LO, The Hong Kong Polytechnic University, Hong Kong, China, and LI LIN, Zhongshan University, School of Pharmaceutical Sciences, Guangzhou, China

IWC-05-44

**Prepared Discussion By:** WILLIAM MILLER, GE Mobile Water, Inc., Norfolk, VA

# Maximizing Cooling Water System Performance Session

*Session Chair:* Michael Dalton, Ashland Specialty Chemical Company, Katy, TX  
*Discussion Leader:* James Dromgoole, Fort Bend Services, Inc., Stafford, TX  
*IWC Representative:* Alan Smith, Consultant, Pittsburgh, PA

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

PETER DEMAKOS, Niagara Blower Company, Buffalo, NY  
IWC-05-45

**Prepared Discussion By:** JAMES DROMGOOLE, Fort Bend Services, Stafford, TX

## **Dynamic Control of Dynamic Systems: Advances in Cooling System Treatment**

DANIEL CICERO, Nalco Company, Naperville, IL  
IWC-05-46

## **Cooling Tower Diagnostic Testing Technique Solves Refinery Bottlenecking Problem And Avoids 6\$ Million Contingency**

CHARLES FOSTER, Diagnostic Cooling Solutions Inc., Burlington, Ontario, Canada  
IWC-05-47

## **Cooling Tower Film-fill Foulant Removal in a Petrochemical Plant**

JOHN ZIMOWSKI, Dupont Co., Orange, TX  
IWC-05-48

**Prepared Discussion By:** DOUGLAS DEWITT-DICK, Ashland Specialty Chemical, Boonton, NJ

## Biological & Chemical Treatment of Wastewater/ Reuse/ Recycle Session

**Session Chair:** Michael DeVecchio, Shaw Environmental, Inc., Lawrenceville, NJ  
**Discussion Leader:** Julius Isaac, Bechtel Power Corporation, Frederick, MD  
**IWC Representative:** Michael Gottlieb, ResinTech, West Berlin, NJ

### **Innovative MBR Process for Industrial Wastewater Treatment and Reuse**

ALASDAIR DONN, ITT Aquious, Basingstoke, Hants, UK and MICHAEL DIMITRIOU, ITT Advanced Water Treatment, Brown Deer, WI  
IWC-05-49

**Prepared Discussion By:** GOMES GANAPATHI, Bechtel International Systems Inc., Amman, Jordan

### **Performance of Multibore Ultrafiltration Systems for Municipal Waste Water Treatment**

C.H. KRISHNAMURTHI RAO and T. JAYACHANDER, Membrane Research Technology Singapore PTE LTD, Singapore  
IWC-05-50

**Prepared Discussion By:** M.N. RAO, Aquatech International Corporation, Canonsburg, PA  
**Author's Closure by:** C.H. KRISHNAMURTHI RAO, T. JAYACHANDER, Membrane Research Technology Singapore PTE LTD, Singapore

### **Treating High Concentrations of Perchlorate in Groundwater Using a Two-Stage Advanced Bioreactor Design**

A. PAUL TOGNA and MICHAEL DELVECCHIO, Shaw Environmental, Inc, Lawrenceville, NJ  
IWC-05-51

### **Water Quality and Water Treatment Requirements for Recycle/Reuse Waters in Industrial and Utility Plants**

GARY LORETITSCH and PAUL PUCKORIUS, Puckorius & Associates, Inc., Evergreen, CO  
IWC-05-52

### **Case Study of Anaerobic Treatment of Winery Wastewater**

ROBERT HICKEY, Ecovation, Inc., Victor, NY  
IWC-05-53

## **Ion Exchange Maintenance/ Monitoring/ Troubleshooting Session**

**Session Chair:** David Dally, Sybron Chemicals, Inc., Birmingham, NJ  
**Discussion Leader:** Peter Meyers, ResinTech, Inc., West Berlin, NJ  
**IWC Representative:** Wayne Bernahl, W. Bernahl Enterprises Ltd., Elmhurst, IL

### **Sixteen Years of Resin Cleaning**

WILLIAM BORNAK, Recirculation Technologies, Inc., Warminster, PA  
IWC-05-54

**Prepared Discussion By:** WAYNE BERNAHL, W. Bernahl Enterprises Ltd., Elmhurst, IL

### **Unusual Items and Procedures in Ion Exchange and Water**

GEORGE J. CRITS, Idreco USA, Corp., Ardmore, PA  
IWC-05-55

**Prepared Discussion By:** MICHAEL HALDEMAN, Tenergy Christ Water, LLC, New Britain, CT

### **Particle Size Analysis of Ion Exchange Resins**

JIM SUMMERFIELD, The Dow Chemical Company, Midland, MI  
IWC-05-56

## Corrosion and Deposition in Steam Turbines Session – Panel Discussion

**Session Chair:** Allan Harvey, Ph.D., National Institute of Standards & Technology, Boulder, CO

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

### Corrosion Steam Turbines

DAVID DANIELS, Mechanical & Materials Engineering, LLP, Austin, TX

IWC-05-57

### Origin and Behaviour of Non-Ionic Natural Organic Matter (NOM) in Boiler Feed Water

STEFAN HUBER, PH.D., DOC-LABOR Dr. Huber, Karlsruhe, Germany

IWC-05-58

### On-line Strategy for Removing Copper Depositions in Turbines

DOUGLAS DEWITT-DICK, Ashland Specialty Chemical, Drew, Boonton, NJ and TOM PIKE, Western Farmers Electric Cooperative, Fort Towson, OK

IWC-05-59

### New Paradigm For Plant Cycle Chemistry Requirements

JAMES BELLOWS, PH.D., Siemens Power Generation, Orlando, FL and MICHAEL RZIHA, Siemens Power Generation, Erlanger, Germany

IWC-05-60

### Panel Discussion Transcript

*This transcript has been prepared by the International Water Conference (IWC) from a panel discussion. It is as accurate as we can reasonably make it, but errors may exist. The authors have not had the opportunity to review the transcript or correct it. Neither, the IWC, the authors, nor the companies which they represent assume any liability for the use of the information in this transcript. The opinions expressed were presented to facilitate discussion and are not necessarily those of the presenters, their employers, or the IWC.*

## **Challenges in Commercial Cooling System Operations-** **Session Coordinated by the Association of Water Technologies (AWT)**

**Session Chair:** Irvin Cotton, Arthur Freedman Associates, Newport, RI  
**Discussion Leader:** Jasbir Gill, Ph.D., Nalco Company, Naperville, IL  
**IWC Representative:** James Datesh, Dacar Industries, Inc., Pittsburgh, PA

### **White Rust on Galvanized Cooling Towers**

ROBERT LEE, R2J Chemical Services, Inc., Largo, FL  
IWC-05-61

**Prepared Discussion By:** JASBIR GILL, PH.D., Nalco Company, Naperville, IL

### **Enhanced Tubes - A Report on Enhanced Tube Problems & Proper Treatment**

JOHN J. (JAY) FARMERIE, Cyrus Rice Water Consultants, Pittsburgh, PA  
IWC-05-62

**Prepared Discussion By:** PAUL PUCKORIUS, Puckorius & Associates, Evergreen, CO

### **Legionella 2003: An Update and Statement by the Association of Water Technologies (AWT)**

WILLIAM PEARSON, II, Southeastern Laboratories, Goldsboro, NC  
IWC-05-63

**Prepared Discussion By:** HELEN CERRA, Chemtreat, Inc., Glen Allen, VA

## Recreational Area/ Potable Water Treatment Applications Session

**Session Chair:** Paul Puckorius, Puckorius & Associates, Inc., Evergreen, CO  
**Discussion Leader:** Arthur Freedman, Arthur Freedman & Associates, Inc., East Stroudsburg, PA  
**IWC Representative:** James Datesh, Dacar Industries, Inc., Pittsburgh, PA

### **CARIX – 20 Years of Non-Polluting Ion Exchange Technology**

WOLFGANG HOELL, PH.D., Forschungszentrum Karlsruhe, Karlsruhe, Germany and KLAUS HAGEN, Krüger WABAG GmbH, Bayreuth, Germany  
IWC-05-64

**Prepared Discussion By:** AL NICKELS, Watertech Inc., Twin Falls, ID

### **Advanced DOC Removal Process: Full Scale Plant Design and Performance**

PAUL SMITH, MICHAEL BOURKE, SHANE JONES, DAVID SHELBAUGH and S. MITCHELL, Orica Watercare Inc., Watkins, CO  
IWC-05-66

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

### **UV Disinfection Equipment Selection and Operation Considerations for Municipal Drinking Water**

KEITH BIRCHER, ELLIOTT WHITBY and SCOTT FRENZ, Calgon Carbon Corporation - UV Technologies Division, Pittsburgh, PA  
IWC-05-67

### **Continuous Real Time Water Monitoring for Radionuclides**

ROBERT GOLDSTEIN, Technical Associates, Canoga Park, CA and DANIEL DOTSON, Jefferson National Laboratory, Newport News, VA  
IWC-05-68

**Prepared Discussion By:** ARTHUR FREEDMAN, PH.D., Arthur Freedman Associates, Inc., East Stroudsburg, PA

## FGD Wastewater Treatment and Recycle Session

**Session Chair:** Mark Janick, P.E., Bechtel Power Corporation, Frederick, MD

**Discussion Leader:** Colleen Kulick, Worley Parsons, Pineville, SC

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

### **Operating Experience on The Treatment on FGD Scrubber Blowdown from an Existing Generating Station**

MICHAEL PUDVAY, Infilco Degremont, Richmond, VA

IWC-05-69

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

JOHN RODGERS, JR., Ph.D., Clemson University, Clemson, SC, GEORGE HUDDLESTON, Entrix, Inc., Pendleton, SC and

CYNTHIA MURRAY-GULDE and DOUGLAS MOONEY, Entrix, Inc, Atlanta, GA

IWC-05-70

**Prepared Discussion By:** MARK JANICK, Bechtel Power Corporation, Frederick, MD

### **Constructed Wetlands for FGD Blowdown Treatment Design and Construction Issues**

DOUGLAS MOONEY, ENTRIX, Inc., Atlanta, GA and ROBERT WYLIE, Duke Energy Corp., Charlotte, NC

IWC-05-71

### **Biological Selenium Removal from FGD Wastewater**

JILL SONSTEGARD and TIM PICKETT, Zenon Environmental, Salt Lake City, UT

IWC-05-72

**Prepared Discussion By:** DONALD VACKER, Bechtel Corporation, Houston, TX

### **Selenium Reduction Issues in a Coal Fired Power Plant**

TERRY SCHEURMAN, Applied Specialties, Inc., Avon Lake, OH

IWC-05-73

**Prepared Discussion By:** MAREK MIERZEJEWSKI, USFilter, a Siemens Business, Glen Allen, VA

## Advances in Membrane Technology for Water and Wastewater Treatment Session

**Session Chair:** Jonathan Wood, USFilter, Lowell, MA  
**Discussion Leader:** Cheryl Sawyer, Cogentrix, Suffolk, VA  
**IWC Representative:** Joseph Loftis, Consultant, Pittsburgh, PA

### **Membrane Technologies for Wastewater Reuse Applications**

PETER CARTWRIGHT, P.E., Cartwright Consulting Company, Minneapolis, MN  
IWC-05-74

### **Microfiltration Performance Enhancement Using an Air-Scour, Air-Assisted Backwash Regime**

GLEN SUNDSTROM, USFilter Memcor Products, Rockford, IL and RUSS SWERDFEGER, USFilter Memcor Products, Colorado Springs, CO  
IWC-05-75

**Prepared Discussion By:** JOHN POTTS, Kimley-Horn and Associates, Inc., West Palm Beach, FL  
**Author's Closure by:** GLEN SUNDSTROM, USFilter Memcor Products, Rockford, IL and RUSS SWERDFEGER, USFilter Memcor Products, Colorado Springs, CO

### **Removal of Weakly Ionized Species by Cross-Flow Spiral Wound EDI Modules**

AVIJIT DEY, PH.D., Omexell, Inc., Houston, TX  
IWC-05-76

**Prepared Discussion By:** DAVE TESSIER, PH.D., GE Water & Process Technologies, Guelph, Ontario, Canada

### **A Triple Membrane Process Utilizing Long Path Homogeneous Membrane EDI Units to Produce Deionized Water**

ALLISON MOODY, GE Mobile Water, Norfolk, VA  
IWC-05-77

## Boiler Makeup and Feedwater Treatment Session

*Session Chair:* Anton Banweg, Nalco Company, Naperville, IL  
*Discussion Leader:* William Moore, Calpine Corporation, Houston, TX  
*IWC Representative:* Andrew Calderwood, Consultant, Pittsburgh, PA

### **Outsourced Water Treatment Plant for Boiler Make-up Water: Case Study**

RUSSELL HOURIGAN, GABRIEL NICOLAIDES, Ontario Power Generation, Pickering, Ontario, Canada and MICHAEL DEJAK, Eco-Tec Inc., Pickering, Ontario, Canada  
IWC-05-78

### **Boiler Feed Water Degasification Using Membrane Contactors—New Methods for Optimized Performance**

BRIAN MILLER, JORGE MUNOZ, and FRED WIESLER, Membrana – Industrial Separations, Charlotte, NC  
IWC-05-79

**Prepared Discussion By:** WILLIAM MILLER, GE Mobile Water, Inc., Norfolk, VA

### **A New Easy, Accurate, Reliable Test Method for All Organic Programs Improves Boiler Reliability**

BONNIE HARRIS, Nalco Company, Burlington, Ontario, Canada and ROGER FOWEE, Nalco Company, Naperville, IL  
IWC-05-80

### **High Rate Combined Solids Contacting and Thickening Minimize Footprint and Maximize Treatment**

JERRY PHIPPS, P.E., USFilter, Ames, IA and GLEN SUNDSTROM, USFilter, Rockford, IL  
IWC-05-81



*The Conference on Industrial Water*

## OFFICIAL PROCEEDINGS

### THE INTERNATIONAL WATER CONFERENCE®

#### 67<sup>th</sup> ANNUAL MEETING

OCTOBER 22-26, 2006

The Omni William Penn Hotel  
Pittsburgh, PA

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*General Chair*

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## Legionella

**Session Chair:** Irv Cotton, Arthur Freedman Associates, Newport, RI

**Discussion Leader:** Helen Cerra, ChemTreat, Inc., Glen Allen, VA

**IWC Representative:** Paul Puckorius, Puckorius & Associates, Inc., Evergreen, CO

### **The Legionella Shift: How the Risk from Legionnaires Disease has Changed the Perception of Water Treatment**

MALCOLM TURVEY, Ashland Netherlands, B.V., Drew Industrial, Barendrecht, The Netherlands; JOANNE

KUCHINSKI, Ashland Water Technologies, Drew Industrial, Boonton, NJ

IWC-06-01

**Prepared Discussion By:** WILLIAM F. MCCOY, PH.D., Phigenics, Inc., Naperville, IL

### **Legionella and Biofilm Control with Hydrogen Peroxide**

MARTIN NOSOWITZ, ARKEMA Inc., King of Prussia, PA, PAUL PUCKORIUS, Puckorius & Associates, Inc., Evergreen, CO

IWC-06-02

**Prepared Discussion By:** CHARLES ASCOLESE, GE Water & Process Technologies, Trevose, PA

**Author's Closure By:** MARTIN NOSOWITZ, ARKEMA Inc., King of Prussia, PA, PAUL PUCKORIUS, Puckorius & Associates, Inc., Evergreen, CO

### **Sampling and Analyzing Environmental Samples for Legionella Bacteria**

DOUGLAS TOAL, Aerotech P&K, Cherry Hill, NJ

IWC-06-03

### **Rapid Legionella and Biofilm Identification by DNA**

GEORGE ASPREY, Microbiological Labs, Streetsboro, OH; PA, PAUL PUCKORIUS, Puckorius & Associates, Inc., Evergreen, CO

IWC-06-04

## Potable Water-Advanced Treatment Applications

*Session Chair:* Jane Kucera, Nalco Company, Naperville, IL,

*Discussion Leader:* Colleen M. Layman, P.E., Bechtel Power Corporation, Frederick, MD

*IWC Representative:* Andrew Calderwood, Consultant, Pittsburgh, PA

### **Multi-Parameter Analytical "Fingerprinting" For The Identification of Water Contamination Events in Potable and Process Water**

SCOTT CROSIER, Hach Company, Fairport, NY

IWC-06-05

**Prepared Discussion By:** COLLEEN LAYMAN, P.E., Bechtel Power Corporation, Frederick, MD

### **Calcium Removal from Water**

PETER MEYERS, ResinTech, Inc., Inc., West Berlin, NJ

IWC-06-06

**Prepared Discussion By:** AL FARBER, Bechtel National, Frederick, MD

### **Effect of pH and Silica on Arsenic Selective Medias**

MICHAEL GOTTLIEB, PETER MEYERS, ResinTech, Inc., West Berlin, NJ

IWC-06-07

## Predictive Techniques for the Assessment of Cooling Water Performance

**Session Chair:** Michael Dalton, Ashland Specialty Chemical Company, Katy, TX,

**Discussion Leader:** Robert Ferguson, French Creek Software, Kimberton, PA

**IWC Representative:** Alan Smith, Consultant, Pittsburgh, PA

### On-Line Analysis of Water Treatment Programs

JOHN RICHARDSON, RICHARD E. GEISLER, DALE P. STUART, RICHARD H. TRIBBLE, ChemTreat, Inc., Ashland, VA, and MICHAEL G. TRULEAR, ChemTreat, Inc., Glen Allen, VA

IWC-06-08

**Prepared Discussion By:** SAL ESPOSITO, GE Water And Process Technologies, Trevose, PA

### Prediction and Monitoring of Fouling in Recirculating Cooling Water System Heat Exchangers

DOUGLAS DEWITT-DICK, Ashland Specialty Chemical Company, Portland, TX; EDWARD S. BEARDWOOD, Ashland Water Technologies, Toronto, ON., Canada

IWC-06-09

**Prepared Discussion By:** DAVID SCHLOTTENMIER, Bridger Scientific, Sagamore Beach, MA

(NOT AVAILABLE FOR PUBLICATION)

**Author's Closure By:** DOUGLAS DEWITT-DICK, Ashland Specialty Chemical Company, Portland, TX; EDWARD S. BEARDWOOD, Ashland Water Technologies, Toronto, ON., Canada

### Evaluation of Scale Inhibitors for Cooling Waters Using Electrochemical Impedance Spectroscopy

JESUS MARIN-CRUZ, Instituto Mexicano del Petróleo, C.P., Mexico

IWC-06-10

## **Zero Liquid Discharge: Panel Discussion**

*Session Chair:* Cheryl Sawyer, Cogentrix, Inc., Suffolk, VA,  
*IWC Representative:* Kumar Sinha, Bechtel Power, Frederick, MD

### **FGD Waste Water Blowdown Treatment and ZeroLiquid Discharge**

DEVESH MITTAL, JACK HOSKIN, Aquatech International Corporation, Canonsburg, PA  
IWC-06-11

### **Start-up, Commissioning, and Operational Data From the World's First SAGD Facilities Using Evaporators to Treat Produced Water for Boiler Feedwater**

LANNY WEIMER, WILLIAM HEINS, GE Water & Process Technologies, Bellevue, WA  
IWC-06-12 **NOT AVAILABLE FOR PUBLICATION**

### **ZLD Systems for Power Plants**

MICHAEL PRESTON, Black & Veatch Corporation, Overland Park, KS  
IWC-06-13

### **ZLD: General Topics of Interest**

DANIEL BJORKLUND, AquaChem ICD,  
IWC-06-58 **NOT AVAILABLE FOR PUBLICATION**

## Produced Water

*Session Chair:* Manoj Sharma, Aquatech International Corp., Canonsburg, PA,

*Discussion Leader:* Allan L. Farber, Bechtel National Inc., Frederick, MD

*IWC Representative:* James R. Datesh, Dacar Industries, Inc., Pittsburgh, PA

### **Desalination of Produced Water using OPUS Technology**

LNSP NAGGHAPPAN, N.A. Water Systems, a Veolia Water Solutions & Technology Company, Pittsburgh, PA  
IWC-06-14

**Prepared Discussion By:** CAROLINE WILSON MUSSBACHER, Encana Oil & Gas Partnership, Calgary, AB, Canada

### **High Efficiency De-oiling for Improved Produced Water Quality**

MICHAEL BRIDLE, WorleyParsons MEG Ltd., Calgary, Alberta, Canada  
IWC-06-15

### **Fresh, Produced, and Newest Brackish Water Ion Exchange Treating at the CNRL Wolf Lake Thermal Operations**

MELONIE MYSZCZYSZYN, Canadian Natural Resources Limited, Bonnyville, AB, Canada  
IWC-06-16

### **Water Reuse in Alberta Heavy Oil Extraction**

RAFAEL GAY-DE-MONTELLA, SHULAMIT KULTNER, Colt Engineering Corporation, Calgary, AB, Canada  
IWC-06-17

**Prepared Discussion By:** GORDON PAGE, Encana, Calgary, AB, Canada; CAROLINE WILSON MUSSBACHER, EnCana Oil and Gas Partnership, Calgary, AB, Canada

## **Raw Water Pretreatment**

*Session Chair:* George Abraham, Veolia Water Solutions & Technologies, Moon Township, PA,

*Discussion Leader:* John Kane, N.A. Water Systems, Moon Township, PA

*IWC Representative:* Bradley Wolf, Veolia Water North America, Moon Township, PA

### **Two Stage Clarification Process Ensures Consistent Performance**

RICHARD ROSS, PE, Siemens Water Technologies, Chalfont, PA, ERIC LAWRENCE, Siemens Water Technologies, Ames, IA., & GLEN SUNDSTROM, Siemens Water Technologies, Rockford, IL.  
IWC-06-18

**Prepared Discussion By:** ROBERT APPLEGATE, Graver Water Systems, LLC, Cranford, NJ

### **Effective Monitoring of Ion Exchange Pretreatment System Performance**

ROBERT HOLLOWAY, Holloway Associates, Etobicoke, ON, Canada  
IWC-06-19

### **Sand Ballasted High Rate Clarification Process for Treatment of Process Water**

CHARLES BLUMENSCHNEIN, P.E., DEE, ERICA LATKER, KASHI BANERJEE, N.A. Water Systems, a Veolia Water Solutions & Technologies Company, Moon Township, PA  
IWC-06-20

**Prepared Discussion By:** CHRIS HOWELL, Crown Solution, Inc., Vandalia, OH

### **A New High Performance Dead-end Ultrafiltration**

EMMANUEL DOUSSIERE, Aquasource, Toulouse, France  
IWC-06-21

## **Water Reclamation/ Conservation/Recycle/ Reuse**

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

*Discussion Leader:* Daniel C. Sampson, Nalco Company, Vallejo, CA

*IWC Representative:* Joseph Loftis, Consultant, Pittsburgh, PA

### **Innovative Membrane Waste Disposal for the Taunton River Desalination Plant**

ERIK NOTTLESON, Inima USA, Brockton, MA

IWC-06-22

### **Water Recovery from the Atmosphere in Humid Climates such as in United Arab Emirates (UAE)**

ESAM ELSARRAG, Technical Studies Institute, Abu Dhabi, UAE

IWC-06-23

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

PETER DEMAOKOS, Niagara Blower Co., Buffalo, NY

IWC-06-24

### **Department of Energy/Office of Fossil Energy's Innovations for Existing Plants (IEP) R&D Program**

SARA PLETCHER, BARBARA CARNEY, SARAH FORBES, U.S. Department of Energy - National Energy Technology Laboratory, Morgantown, WV; ANDREA MCNEMAR, Science Applications International Corporation, Morgantown, WV

IWC-06-25

## **Advances In Biological/Chemical Wastewater Treatment Applications**

*Session Chair:* Stanley Karrs, Siemens, Warrendale, PA,

*Discussion Leader:* Shashi Gorur, PE, Siemens Water Technologies, Warrendale, PA

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

### **Submerged Membrane Bioreactors for Water Reclamation**

BALAVISWANATH, TAO GUIHE, KIRAN KEKRE, Centre for Advanced Water Technology, Singapore Util. Int'l. PTE LTD., Singapore; HARRY SEAH, Public Utilities Board, Singapore  
IWC-06-26

### **Innovated Bio-ecological Process for Municipal Sewage and Sludge Stabilization.**

GODEFROID BUKURU, YANG JIAN, Tongji University, Shanghai, China  
IWC-06-27

### **Volatilization of Trihalomethanes from Big Wapwallopen Creek, Pennsylvania**

LAWRENCE OWOPUTI, PH.D., P.E., JERRY PENLAND AND JOHN BALEWSKI, P.E., ATS-Chester Engineers, Pittsburgh, PA  
IWC-06-28

## **ASME Sponsored Session: Controlling Water Chemistry in High Pressure Boiler Systems**

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

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

### **A Comprehensive Look at Conductivity Measurement in Steam and Power Generation Waters**

DAVID M. GRAY, Mettler-Toledo Thornton, Inc., Bedford, MA

IWC-06-29

### **Is Cation Conductivity Monitoring Relevant For Today's Combined Cycle Power Plant? – Yet Another Case Study Says It Is Not**

LUIS CARVALHO, PE., GE Water & Process Technologies, Mississauga, ON, Canada; THOMAS JAMES, GE Water & Process Technologies, Oklahoma, OK; WILLIAM HUNTER, PowerSmith Cogeneration, Oklahoma City, OK

IWC-06-30

PA

### **Online Ion Chromatography to Monitor Boiler Water Chemistry**

BEVERLY NEWTON, Dionex Corporation, Sunnyvale, CA

IWC-06-31

### **Experience and Use of Oxidation Reduction Potential (ORP) Measurements in Power Plant Applications**

STEPHEN SHULDER, Constellation Energy, MD

IWC-06-32

### **Panel Discussion Transcript**

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## Heavy Metal Removal

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

*Discussion Leader:* H. Robert Goltz, Ph.D., Dow Special Separations, Midland, MI

*IWC Representative:* Craig Brown, P.Eng., Chemionex, Pickering, Ontario, Canada

### **Towards a Resin-in-Pulp Process for Recovery of Nickel and Cobalt from Laterite Leach Tailings: an Iminodiacetic Acid Ion Exchange Resin as a Prospective Resin**

BEREND WASSINK, MARVIN NEUFELD & DAVID DREISINGER University of British Columbia - Dept. of Materials Engr., Vancouver, BC, Canada; GAVIN K.W. FREEMAN, Sherritt International Corporation, Calgary, AB, Canada  
IWC-06-33

**Prepared Discussion By:** CRAIG BROWN, P.Eng., Chemionex, Pickering, ON, Canada

**Author's Closure By:** BEREND WASSINK, MARVIN NEUFELD & DAVID DREISINGER University of British Columbia - Dept. of Materials Engr., Vancouver, BC, Canada; GAVIN K.W. FREEMAN, Sherritt International Corporation, Calgary, AB, Canada

### **Performance Improvements through Structural Design and Comparisons with Polystyrene Resins of Silica Polyamine Composites**

EDWARD ROSENBERG, PH.D., CAROLYN HART, MARK HUGHES, VARADHARAJAN KAILASAM, JESSE ALLEN, JESSICA WOOD, BRIANNE CROSS, University of Montana/ Purity Systems, Inc., Missoula, MT  
IWC-06-34

**Prepared Discussion By:** MICHAEL PALEOLOGOU, NACEUR JEMAA, Pulp And Paper Research Institute Of Canada, Pointe Clair, QE, Canada

### **Metal Removal and Recovery from Process Solutions using Short Bed Ion Exchange**

PAUL PAJUNEN, P.ENG., AND MICHAEL SHEEDY, P.ENG., Eco-Tec Inc., Pickering, ON, Canada  
IWC-06-35

**Prepared Discussion By:** PHILIP FATULA, Sybron Chemicals Inc., a Lanxess Company, Pittsburgh, PA

## **ASME Sponsored Session: Start-ups and Cycling of HRSGs in Combined Cycle Plants**

**Session Chair:** Edward Beardwood, Ashland Chemical Drew Division, Ajax, Ontario,

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

### **Designing HRSG's for Cycling**

JOSEPH SCHROEDER, LEWIS DOUGLAS, PE, Nooter Eriksen, Fenton, MO

IWC-06-36

### **Chemistry Challenges for Cycling Heat Recovery Steam Generators**

DAVID DANIELS, Mechanical & Materials Engineering, LLP, Austin, TX

IWC-06-37

### **Failure Analysis Case Histories Associated with Start-ups and Cycling of Heat Recovery Steam Generators**

DAVID KOTWICA, GE Water & Process Technologies, The Woodlands, TX

IWC-06-38

### **Measurement of Iron Oxide Throw Associated with Start-ups and Cycling of Heat Recovery Steam Generators in Combined Cycle Power Plants**

CHARLES KUHfeldt, Ashland Water Technologies, Drew Industrial, Boonton, NJ

IWC-06-39

### **Panel Discussion Transcript**

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## **Innovative Membrane System Applications /Troubleshooting Of Membrane Systems**

*Session Chair/IWC Representative:* Wayne Bernahl, W. Bernahl Enterprises Ltd., Elmhurst, IL

*Discussion Leader:* Jonathan Wood, Siemens Water Technologies, Lowell, MA

### **Reverse Osmosis Troubleshooting: Improving RO Performance**

JANE KUCERA, Nalco Company, Naperville, IL

IWC-06-40

**Prepared Discussion By:** MICHAEL PRESTON, Black & Veatch Corporation, Overland Park, KS

**Author's Closure By:** JANE KUCERA, Nalco Company, Naperville, IL

### **Design, Construction and Operation of a 6,730 gpm RO/CEDI System for ConEdison's East River Repowering Project**

CHRISTINA HO, Consolidated Edison, New York, NY; JONATHAN WOOD, Siemens Water Technologies, Ionpure Products, Lowell, MA

IWC-06-41

### **Maximizing Membrane Performance through Pretreatment Optimization**

JOHN CLARK, Chemtrac Systems, Inc., Norcross, GA

IWC-06-42

## Special Applications of Ion-Exchange Technologies

*Session Chair:* Peter Midgley, Anderson Water Systems, Dundas, Ontario,

*Discussion Leader:* Jim Sabzali, Thermax Inc., Novi, MI

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

### **Condensate Polishing: An Overview of Available Technologies, Advantages, Disadvantages and Economics**

ROBERT APPLGATE, MICHAEL O'BRIEN, Graver Water Systems, LLC, Cranford, NJ

IWC-06-43

**Prepared Discussion By:** KENNETH FREDERICK, Ion Exchange Associates, LLC, Smithville, WV

### **New Procedure for Removing Organic Fouling from Anion Resins**

WILLIAM BORNAK, Recirculation Technologies Inc., Warminster, PA

IWC-06-44

### **Unusual Items and Procedures in Ion Exchange and Water, II**

GEORGE CRITS, Idreco, USA, West Chester, PA

IWC-06-45

**Prepared Discussion By:** CLAUDE GAUTHIER, P.ENG., The Purolite Company, Kitchener, ON, Canada

### **Mixed Bed Resin Storage**

PETER MEYERS, FRANK DESILVA ResinTech, Inc., West Berlin, NJ

IWC-06-46

## **FGD Methods Influencing Water Use and Treatment of Wastewater**

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

*Discussion Leader:* Clayton Finney, GE Infrastructure, Houston, TX

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

### **Mercury Separation from Flue Gas Scrub Water with TMT 15**

JOE LALLY, BOB GEC, Degussa Corporation, Parsippany, NJ; RUEDIGER PELDSZUS, Degussa AG

IWC-06-47

### **New European Regulatory Requirements Drive Stringent FGD Purge Water Implementation**

LAWRENCE GURNARI, N.A. Water Systems, a Veolia Water Solutions & Technologies company, Moon Township, PA;

WILLIAM SHAW, HPD, Plainfield, IL; MICHAEL VENDRUP & TERKEL CHRISTENSEN, Kruger A/S, Denmark

IWC-06-48

### **Analytical and Preparatory Issues Associated with Total and Speciation Analysis of Selenium**

HAKAN GURLEYUK, PH.D., RUSS GERARDS Applied Speciation and Consulting, LLC, Tukwila, WA

IWC-06-49

## **Fouling Control in Water Systems; Updated Information**

*Session Chair:* Wayne Micheletti, Wayne C. Micheletti, Inc., Charlottesville, VA,

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

*IWC Representative:* Alan Smith, Consultant, Pittsburgh, PA

### **Enhanced Tube Fouling Under Cooling Water Conditions**

EDWARD BEARDWOOD, Ashland Water Technologies, Ajax, ON, Canada; GEORGE HAYS, STEVEN COLBY, Ashland Water Technologies, Boonton, NJ

IWC-06-50

**Prepared Discussion By:** JAY FARMERIE, Cyrus Rice Water Consultants, Inc., Pittsburgh, PA

**Author's Closure By:** EDWARD BEARDWOOD, Ashland Water Technologies, Ajax, ON, Canada

### **Simultaneous Cleaning and Disinfection of Cooling Water Systems**

JASBIR GILL, PH.D., AMIT GUPTA, Nalco Company, Naperville, IL

IWC-06-51

**Prepared Discussion By:** ARTHUR FREEDMAN, PH.D., Arthur Freedman Associates, Inc., East Stroudsburg, PA

### **Opportunities and Pitfalls: The Successful Design and Implementation of Sodium Hypochlorite Systems**

ANTON CALLERY, ITT Advanced Water Treatment/Portacel, Inc., The Woodlands, TX

IWC-06-52

**Prepared Discussion By:** RAYMOND POST, P.E., GE Water & Process Technologies, Trevose, PA

### **Environmental Effects of Electrolytically Generated Halogens for Biofouling Control**

RUDOLF MATOUSEK, Severn Trent Services, Sugar Land, TX; DAVID HILL, Severn Trent De Nora LLC, Sugar Land, TX; R.P. HERWIG, Ph.D., School of Aquatic & Fisher Sciences, University of Washington, Seattle, WA

IWC-06-53

**Prepared Discussion By:** CHRISTOPHER NALEPA, PH.D., Albemarle Corp., Baton Rouge, LA

## **Strategic Marketing & Business Planning**

*Session Chair:* Bradley Wolf, Veolia Water North America, , ,

*IWC Representative:* James R. Datesh, Dacar Industries, Inc., Pittsburgh, PA

### **Water, Water Everywhere.....?**

ERIC BECKMAN, PH.D., University of Pittsburgh, Pittsburgh, PA

IWC-06-54

### **BOMA Perspective**

JOHN GREENWALD, Mechanical Operations Co., Inc. & BOMA, Pittsburgh, PA

IWC-06-55

### **Business Continuity Planning**

MICHAEL SMITH, ReadySmith, Inc., Oakville, ON, Canada

IWC-06-56

### **Intellectual Property Protection – Avoiding Loss of Trade Secrets**

KEITH HADDAWAY, PH.D., Esq., CLIFTON MCCANN, Esq., Venable LLP, Washington, DC

IWC-06-57



*The Conference on Industrial Water*

## **OFFICIAL PROCEEDINGS**

### **THE INTERNATIONAL WATER CONFERENCE®**

#### **68<sup>th</sup> ANNUAL MEETING**

OCTOBER 21-25, 2007

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## Approaches to Minimizing Membrane Fouling

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

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

ANIL KUMAR and SONNY SACHDEVA, Department of Chemical Engineering, Indian Institute of Technology, Kanpur, Kalyanpur, India  
IWC-07-03

**Prepared Discussion By:** JONATHAN WOOD, USFilter, Lowell, MA

### **High-Efficiency Filtration For Membrane Pretreatment**

JASON P. FUES and JANE KUCERA, Nalco Company, Naperville, IL  
IWC-07-04

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

SCOTT BEARDSLEY and CRAIG GRANLUND, Dow Water Solutions, Edina, MN  
IWC-07-05

**Prepared Discussion By:** MICHAEL PRESTON, Black & Veatch Corporation, Overland Park, KS

## **Water, Wastewater and Biological Treatment**

**Session Chair:** Kar Munirathinam, PhD, NA Water Systems, Moon Township, PA,  
**Discussion Leader:** Anthony Selby, Water Technology Consultants, Inc., Evergreen, CO  
**IWC Representative:** Paul Puckorius, Puckorius & Associates, Inc./Water Training Services, Arvada, CO

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

SUN-JIP KIM, JIN-YOUNG PARK, WON-KWON LEE, G&G Co., Ltd., Suwon, Korea, YONG-WOO LEE, JAE-JIN LEE, Samsung Engineering Co., Ltd., Seoul, Korea, KYU-WON HWANG, Samsung Electronics Co., Ltd., Hwasung, Korea, WILEY WANG, VRTX Technologies Co., LLC., Schertz, TX, USA  
IWC-07-06

### **Treatment Efficiency Improvement of Existing Pulp and Paper Industry Wastewater Treatment Plants With Suspended Carrier Biofilm Process (SCBP)**

ARI KETONEN, Eimco Water Technologies, Salt Lake City, UT and M. KIERIKKA and P. PAJUNIEMI, Eimco Water Technologies, Turku, Finland  
IWC-07-07

**Prepared Discussion By:** PAUL TOGNA, PH.D., Shaw Environmental Inc., Lawrenceville, NJ

### **Application Of Advective-Flow Membrane-Aerated Biofilm Reactor (AF-MABR) for Treatment of Ammonium-rich Wastewater**

ALI R. AHMADI MOTLAGH, JABIN JOSEPH, TIMOTHY LAPARA, MICHAEL SEMMENS, Department of Civil Engineering, University of Minnesota, Twin Cities, MN  
IWC-07-08

**Prepared Discussion By:** ENOS STOVER, PH.D, The Stover Group, Stillwater, OK

### **Application of Activated Carbon Technologies in Supplemental Point-Of-Use (POU) and Point-of-Entry (POE) Drinking Water Treatment**

GARY L. HATCH, PH.D and TARA KOELE, Pentair Filtration, Inc., Sheboygan, WI  
IWC-07-02

## **Zero Liquid Discharge Techniques and Applications**

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

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

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

### **Achieving Zero Blowdown for Cooling Towers**

SAM OWENS and RICK MAXEY, CHEMICO International, Inc., Corpus Christi, TX  
IWC-07-09

**Prepared Discussion By:** WILLIAM SHAW, PE, HPD LLC, Pewaukee, WI

### **Leading Chemical Manufacturer's Plant In South India to Become A Zero Liquid Discharge Unit**

AJANTA SARKAR and SACHIN KUKADE, Aquatech Systems ( Asia) Pvt. Limited, Pune, India  
IWC-07-10

**Prepared Discussion By:** JAMES MOEN, Roseville Electric, Roseville, CA

### **ZLD: New Silica Based Inhibitor Chemistry Permits Cost Effective Water Conservation For HVAC And Industrial Cooling Towers**

DAN DUKE, Water Conservation Technology International, Inc., Temecula, CA  
IWC-07-11

## Improving Performance of Steam Electric Generating Plants

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

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

RUSI KAPADIA, MICHAEL SHEEDY, DONALD SWAINE, Eco-Tec Inc., Pickering, ON, Canada, PATRICIA M. SCROGGIN, Burns & McDonnell, Kansas City, MO  
IWC-07-12

**Prepared Discussion By:** ARUN MITTAL, Aquatech International Corporation, Canonsburg, PA

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

KATHI KIRSCHENHEITER, MICHAEL CHUK, COLLEEN LAYMAN, and KUMAR SINHA, Bechtel Power Corporation, Frederick, MD  
IWC-07-13

**Prepared Discussion By:** ROBERT BARTHOLOMEW, Shepherd T. Powell & Associates, Baltimore, MD

### **Treatment of Wastewaters from Coal-Fired Power Plants**

WILLIAM SHAW, PE, Veolia Water Solutions & Technologies Company, Pewaukee, WI  
IWC-07-14

**Prepared Discussion By:** LANNY WEIMER and ROBERT SOLOMON, PH.D, RCC Thermal Products, Division of GE Water, Ellicott City, MD

## **Ion Exchange Special Applications**

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

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

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

### **Selective Ion Exchange Resins and Their Application for Target Contaminant Removal in Aqueous Systems: Application Overview and New Developments**

STEFAN NEUMANN, PH.D, Lanxess Deutschland GmbH, Leverkusen, Germany and PHIL FATULA Lanxess / Sybron  
Birmingham, NJ  
IWC-07-15

**Prepared Discussion By:** FRANCIS BOODOO, The Purolite Company, Bala Cynwyd, PA

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

EDWARD ROSENBERG, MARK HUGHES, JESSICA WOOD, Department of Chemistry, University of Montana and  
Purity Systems Inc., Missoula, MT  
IWC-07-16

**Prepared Discussion By:** ROBERT ALBRIGHT, PH.D, Albright Consulting, Churchville, PA

### **Evaluation of Tri-Bromide Resin for Bacterial Purification of Drinking Water**

SHIRISH NAIK, S.V.MOKASHI, SUJATA KULKARNI, & KIRAN DESHPANDE, Thermax Ltd, Pune, India  
IWC-07-17

**Prepared Discussion By:** GREG VERO, Orica Watercare Inc., Oxford, NC

### **Ion Exchange Resins as Stationary Phase in Industrial Chromatographic Separation**

HEIKKI MONONEN, Finex Oy (Inc), Kotka, Finland  
IWC-07-18

**Prepared Discussion By:** GORDON ROSSITER, IXSEP, Houston, TX

## Legionella

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

### **Use of IQ-CHECK™ LEGIONELLA Kits as a New Tool for Efficient Legionella Monitoring in Water Samples**

FRÉDÉRIC MARTINEZ , HÉLÈNE FRENKIEL-LEBOSSÉ, SOPHIE PIERRE, VELIANA TODOROVA, Bio-Rad, Marnes-la-Coquette, France  
IWC-07-19

### **An Overview Of Legionella Analysis**

DIANE MISKOWSKI, MPH, EMSL Analytical Inc., Westmont, NJ  
IWC-07-20

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

ZHE ZHANG, PH.D., San Air Technologies Laboratory, Inc., Powhatan, VA and PAUL PUCKORIUS, Puckorius & Associates, Inc., Arvada, CO  
IWC-07-21

### **Panel Participant**

GEORGE LICINA, Structural Integrity Associates, Inc., San Jose, CA

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## **Blowdown Recycle and Equipment Design Consideration for Produced Water**

**Session Chair:** Rafael Gay-de-Montella, Colt Engineering, Calgary, AB, Canada

**Discussion Leader:** Michael Bridle, P.Eng., WorleyParsons MEG, Calgary, AB, Canada

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

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

ROBERT HOLLOWAY, Holloway Associates, Etobicoke, ON, Canada and GORDON PAGE, Page Technology Ltd., Calgary, AB, Canada  
IWC-07-24

**Author's Closure By:** ROBERT HOLLOWAY, Holloway Associates, Etobicoke, ON, Canada and GORDON PAGE, Page Technology Ltd., Calgary, AB, Canada

**Prepared Discussion By:** JOHN FAIR P. ENG., Fair Canada Engineering Ltd., Calgary, AB, Canada

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

ROWENA PENARANDA and RAFAEL GAY-DE-MONTELLA, Colt Engineering Corporation, Calgary, AB, Canada  
IWC-07-25

**Prepared Discussion By:** CAROLINE WILSON-MUSSBACHER, Encana Integrated Oilsands Division, Calgary, AB, Canada

### **Waste Water Treatment Options for a SAGD Oil Production Facility**

STEVE PORTELANCE, WorleyParsons MEG, Calgary, AB, Canada  
IWC-07-26

**Prepared Discussion By:** KAREN KWASNIEWSKI, Encana Oil and Gas Partnership, Calgary, AB, Canada

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

MELONIE MYSZCZYSZYN, Canadian Natural Resources Limited, Bonnyville, AB, Canada  
IWC-07-27

## **Experiences Associated with Extended Lay-ups of Steam Generation Systems and Subsequent Return to Service--Panel Discussion Sponsored by ASME Research Committee**

**Session Chair:** Edward (Ted) Beardwood, Ashland Chemical Drew Division, Ajax, Ontario, Canada  
**IWC Representative:** David Simon, Cyrus Rice Water Consultants, Pittsburgh, PA

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

JAMES DROMGOOLE, Fort Bend Services, Inc., Stafford, TX  
IWC-07-28

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

TOM PIKE, Western Farmers Electric Co-operative, Fort Towson, OK and DOUGLAS DEWITT-DICK, Ashland Water Technologies, Portland, TX  
IWC-07-29

### **Declining Pressure Method for Boiler Storage and Boiler Cleanliness Assessment By Ultrasonic Technique**

BILL STROMAN, Primary Energy, San Diego, CA  
IWC-07-30

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

MICHAEL CARAVAGGIO, Ontario Power Generation, Courtright, ON, Canada  
IWC-07-31

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

WILLIAM MOORE, Calpine Corporation, Houston, TX  
IWC-07-32

**NOT AVAILABLE FOR PUBLICATION**

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

DOUGLAS DEWITT-DICK, Ashland Water Technologies, Portland, TX and CARLOS BENAVIDES, Topaz Energy  
IWC-07-33

**NOT AVAILABLE FOR PUBLICATION**

### **Panel Discussion Transcript**

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## Open Cooling Water Systems

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

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

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

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

WILLIAM HARFST, Harfst and Associates, Inc., Crystal Lake, IL

IWC-07-34

**Prepared Discussion By:** JAMES KANUTH, Chemtreat, Inc., Glen Allen, VA

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

STANLEY PICKENS, PH.D, PPG Industries, Inc., Monroeville, PA

IWC-07-35

**Prepared Discussion By:** FARAH AZARNIA, Albemarle Corporation, Baton Rouge, LA

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

BRUCE LARKIN, PE, Black & Veatch, Overland Park, KS and SUSAN CINELLI, Board of Public Utilities (BPU), Kansas City, KS

IWC-07-36

**Author's Closure By:** BRUCE LARKIN, PE, Black & Veatch, Overland Park, KS and SUSAN CINELLI, Board of Public Utilities (BPU), Kansas City, KS

**Prepared Discussion By:** JAMES W. CUCHENS, P.E., Southern Company Services, Inc, Birmingham, AL

## **State of the Art FGD Wastewater Treatment Technologies and Discharge Limits**

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

**Discussion Leader:** Devesh Mittal, Aquatech International Corporation, Stafford, TX

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

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

CYNTHIA MURRAY-GULDE, F. DOUGLAS MOONEY, ENTRIX, Atlanta, GA, GEORGE M. HUDDLESTON III, ENTRIX, Inc., Pendleton, SC, JOHN H. RODGERS, JR., and DEREK EGGERT, Department of Forestry and Natural Resources, Clemson University, Clemson, SC

IWC-07-37

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

COLLEEN CHAPMAN and COLLEEN LAYMAN, PE, Bechtel Power Corporation, Frederick, MD

IWC-07-38

**Prepared Discussion By:** PAUL CHU, EPRI, Palo Alto, CA

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

MARK NICHOLSON, PE, HPD LLC, Plainfield, IL

IWC-07-39

**Prepared Discussion By:** MICHAEL PRESTON, Black & Veatch Corporation, Overland Park, KS

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

GREG MANDIGO, Aquatech ICD, Hartland, WI

IWC-07-40

**Prepared Discussion By:** PATRICIA SCROGGIN, PE, Burns and McDonnell, Kansas City, MO

## Advanced Membrane Operations and Applications

**Session Chair:** Lawrence Krzesowski, P.E., GM Worldwide Facilities Group, Pontiac, MI,

**Discussion Leader:** Steven Gagnon, AVANTech, Inc., Columbia, SC

**IWC Representative:** Wayne Bernahl, W. Bernahl Enterprises Ltd., Elmhurst, IL

### Commission of a Water Treatment System in NZ

STEVEN GAGNON, AVANTech, Inc., Columbia, SC

IWC-07-41

### EDI Performance and Resin Filled Concentrate Compartments

JOHN BARBER, GE Water and Process Technologies, Guelph, ON, Canada and DAVID TESSIER, GE Water & Process Technologies, Waterloo, ON, Canada

IWC-07-42

**Prepared Discussion By:** JEFFREY TATE, Agape Water Solutions, Inc., Harleysville, PA

### Pushing the Limits: New Reverse Osmosis Membrane Cleaning Recommendations

CRAIG BRODEN, Dow Water Solutions, Edina, MN and CLIFFORD GILBERT, Dow Water Solutions, Mount Laurel, NJ

IWC-07-43

**Prepared Discussion By:** TRACY BARKER, AVANTech, Inc., Oak Ridge, TN

## Closed Cooling Water Systems

**Session Chair:** John Kane, NA Water Systems, Moon Township, PA,

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

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

### **Tracking Molybdenum Concentration in Cooling Water Applications**

VADIM MALKOV, Hach Company, Loveland, CO and BLAINE NAGAO, ChemCal, Inc.

IWC-07-44

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

PETER DEMAKOS, P.E., Niagara Blower Co., Buffalo, NY

IWC-07-45

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

WILLIAM STAPP, AS Inc., Santa Rosa, CA; PAUL PUCKORIUS, Puckorius and Associates, Arvada, CO; and CLAYTON WRIGHT, Park Central Office Complex, Denver, CO

IWC-07-46

### **Review Of Closed Water Systems - Treatment Schemes**

JAY FARMERIE, Cyrus Rice Water Consultants, Pittsburgh, PA and Association of Water Technologies (AWT) Technical Committee

IWC-07-47

### **Closed Cooling System Treatment: Using Phosphinosuccinate Oligomers (PSO) as an Alternative to Molybdate**

BARBARA MORIARTY, JOAN CHAO, DAN CICERO, CRAIG MYERS AND F. PHILIP YU, Nalco Company, Naperville, IL

IWC-07-48

## **Industry Experiences with the Treatment of Flue Gas Desulfurization (FGD) Purge Wastewater**

**Session Chair:** Colleen Layman, PE, Bechtel Power Corporation, Frederick, MD,  
**Discussion Leader:** Rick Szilagyi, Westech Engineering, Inc., Rockton, IL  
**IWC Representative:** Mark Cheresnowsky, GE Water & Process Technologies, Gloucester, VA

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

MICHAEL PUDVAY, ROBERT KELLY, and ANTONIO LAU, Degremont Technologies, Richmond, VA; ENOS L. STOVER, Stover & Associates, Inc., Stillwater, OK; and PAUL TOGNA, PhD, Shaw Environmental & Infrastructure, Lawrenceville, NJ  
IWC-07-49

**Prepared Discussion By:** NANDAN VANI, D.SC., P.E., Peer Consultants, P.C., Baltimore, MD

### **Full Scale Implementation of GE Abmet® Biological Technology for the Removal of Selenium from FGD Wastewaters**

JILL SONSTEGARD, JAMES HARWOOD, and TIM PICKETT, GE Water & Process Technologies, Salt Lake City, UT  
IWC-07-50

**Prepared Discussion By:** KAR MUNIRATHINAM, PH.D, N.A. Water Systems, Moon Township, PA

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

PETER TEN EYCK, BILL NICKRAND, and JOHN GUIDOS, Nalco, Wexford, PA; and RICK CLEVELAND and JIM MEZO, Duke Energy, Owensville, IN  
IWC-07-51

**Prepared Discussion By:** ARUN MITTAL, Aquatech International Corp., Canonsburg, PA

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

DEREK EGGERT and JOHN RODGERS, JR., Clemson University, Clemson, SC; and CARL HENSMAN, Frontier Geosciences, Seattle, Washington  
IWC-07-52

**Prepared Discussion By:** DIANE MARTINI, Sargent & Lundy, LLC, Chicago, IL

### **Initial Operating Experience with a Novel FGD Waste Water Treatment System at Duke Energy's Marshall Steam Station**

CYNTHIA BRYANT and ROBERT WYLIE, Duke Energy, Charlotte, NC; and JOE FRANK, ANGELA ZAGALA, and PETER TEN EYCK, Nalco, Naperville, IL  
IWC-07-53

**Prepared Discussion By:** PATRICIA SCROGGIN, PE, Burns And McDonnell, Kansas City, MO

## **Resurgence of the Nuclear Power Industry**

**Session Chair:** Julius Isaac, Bechtel Power Corporation, Frederick, MD,

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

**IWC Representative:** Andrew Calderwood, Consultant, Pittsburgh, PA

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

MICHAEL CHUK and JULIUS ISAAC, PE Bechtel Power Corporation, Frederick, MD

IWC-07-54

**Prepared Discussion By:** BRUCE LARKIN, Black & Veatch, Overland Park, KS

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

K.A. SELBY, Mechanical & Materials Engineering LLC, Evergreen, CO; G.J. LICINA, N. SADEGHI, Structural Integrity Associates, Inc., San Jose, CA; A.V. DAVE, D.M. FULLER, and T.J. GREEN, Arizona Public Service Company - Palo Verde Nuclear Generating Station, Tonopah, AZ; and N.M. WILMSHURST, Electric Power Research Institute, Charlotte, NC

IWC-07-55

**Author's Closure By:** K.A. SELBY, Mechanical & Materials Engineering LLC, Evergreen, CO; G.J. LICINA, N. SADEGHI, Structural Integrity Associates, Inc., San Jose, CA; A.V. DAVE, D.M. FULLER, and T.J. GREEN, Arizona Public Service Company - Palo Verde Nuclear Generating Station, Tonopah, AZ; and N.M. WILMSHURST, Electric Power Research Institute, Charlotte, NC

**Prepared Discussion By:** RAYMOND M. POST, Ge Infrastructure Water & Process Technologies, Trevose, PA

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

MIKE SHEPHERD, GE Water and Process Technologies, Naperville, IL and ERIC GARDNER, GE-Hitachi Nuclear Energy, Wilmington, NC

IWC-07-56

**Author's Closure By:** MIKE SHEPHERD, GE Water and Process Technologies, Naperville, IL and ERIC GARDNER, GE-Hitachi Nuclear Energy, Wilmington, NC

**Prepared Discussion By:** MYRON FELDMAN, Sentry Equipment Corp., Oconomowoc, WI

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

ANDREW KERN, Nalco Company, Lenoir City, TN; PETER TEN EYCK, Nalco Company, Pittsburgh, PA; and GEORGE PEABODY, Nalco Company, Littleton, CO

IWC-07-57

**Author's Closure By:** ANDREW KERN, Nalco Company, Lenoir City, TN; PETER TEN EYCK, Nalco Company, Pittsburgh, PA; and GEORGE PEABODY, Nalco Company, Littleton, CO

**Prepared Discussion By:** KUMAR SINHA, Bechtel Power Corporation, Frederick, MD

## **Ion Exchange**

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

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

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

### **Practical Notes & Procedures in Condensate Polishing**

GEORGE CRITS and WILLIAM RUNYAN, Idreco USA, Inc., W. Chester, PA

IWC-07-58

**Prepared Discussion By:** GERALD ALEXANDER, Siemens Water Technologies, La Canada, CA

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

FATMA BADAWEY and HANY GOMAA, Abu Qir Fertilizers Co., Alexandria, Egypt

IWC-07-59

**Prepared Discussion By:** ALBERT PREUSS, Aldex Chemical Co. Ltd, Granby, QC, Canada

### **Economic Comparison of Electrodeionization and Mixed Bed Unit Operations**

AVIJIT DEY, PH.D, Omexell, Inc., Houston, TX and BILL LOYD, Dow Water Solutions, Minneapolis, MN

IWC-07-60

**Prepared Discussion By:** DOUGLAS KELLOGG, Siemens Water Technologies Corp., Rockford, IL

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

DAVID AUERSWALD, JLS Engineering, Redondo Beach, CA

IWC-07-61

**Author's Closure By:** DAVID AUERSWALD, JLS Engineering, Redondo Beach, CA

**Prepared Discussion By:** BRIAN HOFFMAN, Rohm and Haas Company, Philadelphia, PA

## **New Monitoring Techniques for Boilers, Cooling Towers, Flue Gas Desulfurization, and Process Applications**

*Session Chair:* Deborah Bloom, Nalco Company, Naperville, IL  
*Discussion Leader:* James Dromgoole, Fort Bend Services, Inc., Stafford, TX  
*IWC Representative:* Manoj Sharma, Aquatech International Corp., Canonsburg, PA

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

VADIM MALKOV, Hach Company, Loveland, CO  
IWC-07-62

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

JEFF MCKINNEY, Hach Company, Lawrenceville, GA and NICOLAS LEDERMANN, SERGE HEDIGER and FRANK DUNAND, Hach Ultra Analytics Company  
IWC-07-63

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

ROBERT BRYANT, Chemtrac Systems, Inc., Norcross, GA  
IWC-07-64

**Prepared Discussion By:** JAMES DROMGOOLE, Fort Bend Services, Stafford, TX

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

CARL HENSMAN and MONICA GARICA-STRICKLAND, Frontier Geosciences, Seattle, WA  
IWC-07-65

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## **Produced Water for SAGD Facility**

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

*Discussion Leader:* Donald Downey, Purolite Company, Bala Cynwyd, PA

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

### **Technical, Economic and Environmental Impact of Blending High Hardness Brackish Water for Makeup Water to Generate Steam at Encana's SAGD Facilities**

C. WILSON MUSSBACHER, B.Sc., E.I.T., EnCana Oil and Gas Partnership, Calgary, AB, Canada

IWC-07-66

### **Produced Water and High Salinity Water Treatment at SAGD Facilities**

JOHN BENETTI, Jacobs Canada Inc., Calgary, AB, Canada

IWC-07-67

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

DAN PETERSON, HPD West, Bellevue, WA

IWC-07-68

### **Fouling of WAC and SAC Resins in EOR Applications.**

GUY MOMMAERTS, P.Eng., Ion Exchange Services (Canada) Inc., Elmira, ON, Canada

IWC-07-69

## **Water Reclamation and Reuse**

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

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

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

### **Continuous Blow Down Water Re-Use in Suralaya Coal Fired Power Plant Pt. Indonesia Power with 3400 MW Capacity**

BUDI SATRIYO, PLTU Suralaya - PT.Indonesia Power, Merak- Banten, Indonesia

IWC-07-70

### **Reclaiming Cooling Tower Blowdown - A Case Study at Sasol Synfuels**

HAROLD GRANT, Sasol Technology, Secunda, South Africa

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

PIERRE KWAN, HDR Engineering, Bellevue, WA

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

R. DAVID PYNE, ASR Systems LLC, Gainesville, FL

IWC-07-23

## Poster Session

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

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

### **Treatment of Water Containing Bacteria by Electrochemical Reactor**

EDERIO BIDOIA, P.B. MORAES, I.C.P. GUSMAO, State University of Sao Paulo (UNESP), Rio Claro, Brazil  
IWC-07-75

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

CLIFTON E. MCCANN, ESQ. and KEITH HADDAWAY, Ph.D., Venable LLP, Chevy Chase, MD  
IWC-07-77



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## Condensate Polishing

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

**Discussion Leader:** Donald Downey, Purolite Company, Bala Cynwyd, PA

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

### **Condensate Polishing For Nuclear And Super Critical Power Plants For The 21ST Century**

ROBERT APPLGATE, Graver Water Systems, LLC, Cranford, NJ; AL TAVARES, Graver Technologies, LLC, Glasgow, DE

IWC-08-02

**Prepared Discussion by:** GEORGE CRITS and WILLIAM RUNYAN, IDRECO USA, Ardmore, PA

### **Condensate Polishing System Upgrade with Melt-blown, Reverse Gradient, Backwash Filter Septa**

KAL FAROOQ, Pall Corporation, Port Washington, NY

IWC-08-03

**Prepared Discussion by:** GIL ROYAL, Graver Technologies, Glasgow, DE

## **Current Challenges Facing Nuclear Power Plants**

*Session Chair:* Julius Isaac, Bechtel Power Corporation, Frederick, MD

*Discussion Leader:* Tony Banks, Dominion Resources, Inc., Richmond, VA

*IWC Representative:* Andrew Calderwood, Consultant, Pittsburgh, PA

### **The Evolution of Water Processing Technology at Diablo Canyon Nuclear Power Plant**

SANDY SCHEXNAILDER, GE Water & Process Technologies, Dallas, TX

IWC-08-04

### **Effective Treatment Programs To Control Corrosion and Fouling In Once-Through Nuclear Service Water Systems**

PETER TEN EYCK and GEORGE PEABODY, Nalco Co, Naperville IL

IWC-08-05

**Prepared Discussion by:** K. ANTHONY SELBY, Water Technology Consultants, Inc., Evergreen, CO

### **Water Management Practices in Nuclear Power Plants – Controlling and Monitoring Nutrients in Discharge Streams**

TONY BANKS, Dominion Power, Glen Allen, VA; CUONG TRUONG, GOMES GANAPATHI, JULIUS ISAAC, Bechtel Power Corporation, Frederick, MD

IWC-08-06

## **Monitoring – The Key to Successful Water Treatment Operations**

**Session Chair:** Phil Kiser, Hach Company, Loveland, CO

**Discussion Leader:** Charles Ascolese, GE Water & Process Technologies, Trevose, PA

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

### **A Field Test for Rapid Detection of Legionella pneumophila serogroup 1 in Water Samples**

ANDREW COOPER and TOM LINDLEY, Nalco Company, Naperville, IL; NEIL POLWART and ROSS GRANT, hydrosense Limited, Linlithgow, UK; HOWARD BARNES and ERIC HOLMES, Nalco Company, Northwich, UK  
IWC-08-07

**Prepared Discussion by:** SCOTT M. BOYETTE, PhD, GE Water & Process Technologies, Trevose, PA; JIE LI, KECHAO YANG, JING CHEN, WEIMIN XIAO, and RONG XU, GE Water and Process Technologies, Shanghai, China

### **Novel Electrodeionization Devices: Applications in Inorganic Analysis**

JOHN RIVIELLO, Trovion Co., Santa Cruz, CA; ARCHAVA SIRIRAKS, Trovion Pte, Ltd, Singapore  
IWC-08-08

**Prepared Discussion by:** VADIM MALKOV, PhD., Hach Company, Loveland, CO

### **Update on the Steam Electric Power Effluent Guidelines**

DIANE MARTINI, Sargent & Lundy, Chicago, IL  
IWC-08-09

### **Diagnostics and Control of Scale and Corrosion Stress in a 500 HP Steam Generating System using New Fluorescence and Oxidation-Reduction Technology**

MARTIN GODFREY, RICHARD PETERSON, and STEPHEN MORI, Nalco Company, Naperville, IL  
IWC-08-10

**Prepared Discussion by:** VICKIE OLSON, Honeywell Field Solutions, Atlanta, GA

## **Significance of Hydroxide Alkalinity Control in Steam Generation Systems, a Panel Discussion Sponsored by the ASME Research Committee on Water and Steam in Thermal Systems**

**Session Chair:** Robert Holloway, Holloway Associates, Etobicoke, ON, Canada  
**Discussion Leader:** Deborah Bloom, Nalco Company, Naperville, IL  
**IWC Representative:** David Simon, Cyrus Rice Water Consultants, Pittsburgh, PA

### **Phosphate is Practically Caustic?**

JAMES BELLOWS, PhD, Siemens Energy, Inc., Orlando, FL  
IWC-08-11

### **Silica in Steam Generating Systems**

EDWARD (TED) BEARDWOOD, Ashland Canada Corp., Ajax, ON, Canada  
IWC-08-12

### **An Introduction to Alkalinity Limits for Boiler Water Treatment**

ROBERT BARTHOLOMEW, PE, Sheppard T. Powell Associates, LLC, Baltimore, MD  
IWC-08-13

### **Sodium Hydroxide in Steam Turbines**

JAMES BELLOWS, PhD and SUDHIR RAJAGOPALAN, Siemens Energy, Inc, Orlando, FL  
IWC-08-14

### **Panel Discussion Transcript**

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## Keynote Session

*Session Chair:* Kumar Sinha, PE, IWC Conference Chair

### **The Future of the Water Treatment Industry: The Vision of a Committed Partner**

JEAN-MICHEL HERREWYN, CEO, Veolia Water Solutions & Technologies, Maurice, Il de France, France

## **Achieving Sustainability through Water Recycle/Reuse**

*Session Chair:* Paul Togna, Ph.D., Shaw Environmental, Lawrenceville, NJ  
*Discussion Leader:* Colleen M. Layman, P.E., Bechtel Power Corporation, Frederick, MD  
*IWC Representative:* George Abraham, Veolia Water Solutions & Technologies, Moon Township, PA

### **Design Challenges in Implementing Water Management Controls: A New Look at Water Recycle and Reuse in Power Plants**

LISA BENNETT and KUMAR SINHA, PE, Bechtel Power Corporation, Frederick, MD  
IWC-08-16

**Prepared Discussion by:** DIANE MARTINI, Sargent & Lundy, LLC, Chicago, IL

### **Flue Gas Condensate and Energy Recovery**

MILAN TEPLER, Radscan Intervex AB, Västerås, Sweden; JONATHAN WOOD and PATRICK BUZZELL, Siemens Water Technologies, Lowell, MA  
IWC-08-17

### **Reclaimed Water Use as Cooling Tower Makeup - The Ongoing Challenge**

TIMOTHY EGGERT, GE Water & Process Technologies, Seal Beach, CA; GARY GEIGER, GE Water & Process Technologies, Trevose, PA; DAN HARBS, GE Water & Process Technologies, Fountain Valley, CA  
IWC-08-18

**Prepared Discussion by:** KASHI BANERJEE Ph.D., P.E., DEE, N.A. Water Systems, Veolia Water Solutions & Technologies, Moon Township, PA

## **Legionella - Regulation, Risk Management and Reduction**

**Session Chair:** Michael Trulear, Ph.D., ChemTreat, Inc., Glen Allen, VA  
**Discussion Leader:** Jay Farmerie, Cyrus Rice Water Consultants, Inc., Pittsburgh, PA  
**IWC Representative:** Kumar Sinha, Bechtel Power, Frederick, MD

### **Practical Operation of the Victorian Legionella Legislation Over 6 Years - from an Auditor's Perspective**

PETER ROBERTS, Consultant, Melbourne, Victoria, Australia  
IWC-08-19

### **Lessons Learned from the Implementation of Biocide Strategies in Cooling Towers**

DAVE CHRISTOPHERSEN, Crown Solutions- Veolia Water S&T, Vandalia, OH; KARIM ESSEMIANI, Veolia Water S&T North America, Moon Township, PA; ALAIN VIDAL and SANDRINE OBERTI, Veolia Water R&D, Maisons Laffitte, France; JEAN PIERRE BRIFFAUT, Veolia Environnement R&D, Paris, France  
IWC-08-20

### **Cooling Towers, Drift, and Legionellosis**

THOMAS BUGLER and JOHN LANE, Evapco, Inc., Taneytown, MD; RICHARD MILLER, Ph.D., Microbiology & Immunology, School of Medicine, University of Louisville, Louisville, KY; BARRY FIELDS, Ph.D., Centers for Disease Control and Prevention, Atlanta, GA  
IWC-08-21

**Prepared Discussion by:** JOHN J. FARMERIE, Cyrus Rice Water Consultants, Pittsburgh, PA

**Authors' Closure by:** THOMAS BUGLER and JOHN LANE, Evapco, Inc., Taneytown, MD; RICHARD MILLER, Ph.D., Microbiology & Immunology, School of Medicine, University of Louisville, Louisville, KY; BARRY FIELDS, Ph.D., Centers for Disease Control and Prevention, Atlanta, GA

## Pretreatment

*Session Chair:* Michael Sheedy, Eco-Tec Inc., Pickering, ON, Canada  
*Discussion Leader:* Greg Osen, Christ Water Technology Americas, LLC, New Britain, CT  
*IWC Representative:* Joseph Loftis, Consultant, Pittsburgh, PA

### **Single-stage Vacuum Deaeration Technology for Achieving Low Dissolved Gas in Process Water**

GLENN HARBOLD and JONATHAN PARK, Gas Tran Systems, Cleveland, OH  
IWC-08-22

### **Emerging Water Quality Issues in Combustion Turbine Evaporative Coolers**

DANIEL ROBINETTE, P.E., CH2M HILL, Englewood, CO; CHARLIE NICHOLS, P.E. - CH2M HILL, Atlanta, GA  
IWC-08-23

### **Electropositive Filtration Technology in Automobile Manufacturing Applications**

HENRY FRANK, Argonide Corporation, Sanford, FL; RICK LANCASTER, Toyota Manufacturing, North America  
IWC-08-24

**Prepared Discussion by:** DREW JOHNSON, PhD., PE, University of Texas at San Antonio, San Antonio, TX  
**Authors' Closure by:** HENRY FRANK, Argonide Corporation, Sanford, FL; RICK LANCASTER, Toyota Manufacturing, North America

### **Iron Specific Resin, A Novel Technique and An Excellent Choice For Removal of Iron from Ground Water**

RENU SARAF, Ion Exchange India Ltd., Mumbai, India  
IWC-08-25

**Prepared Discussion by:** RICK SZILAGYI, WesTech Engineering, Rockton, IL

## **Water Treatment in Hydrocarbon Processing and Chemical Processing Steam Systems - Practical Answers to Your Questions, a Session Sponsored by the ASME Research Committee on Water and Steam in Thermal Systems**

**Session Chair:** James Robinson, GE Water & Process Technologies, Trevose, PA  
**IWC Representative:** David Simon, Cyrus Rice Water Consultants, Pittsburgh, PA

### **Steam Reboilers - The Good, The Bad and The Ugly**

DOUGLAS DEWITT-DICK, Champion Technologies, Fresno, TX  
IWC-08-26

### **Condensate Polishing and Reclamation in Hydrocarbon Processing and Chemical PROCESSING STEAM PLANTS**

ROBERT HOLLOWAY, Holloway Associates, Etobicoke, ON, Canada  
IWC-08-27

### **Industrial Steam Purity: Requirements, Proper Sampling and Practical Considerations**

ANTON BANWEG, Nalco Company, Naperville, IL  
IWC-08-28

### **Effective Monitoring and Control in Steam Generating Systems**

IRVIN COTTON, Arthur Freedman Associates, Inc, Newport, RI  
IWC-08-29

### **Panel Discussion Transcript**

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## **Challenges in Dealing with Flue Gas Desulfurization Purge Wastewaters**

*Session Chair:* Colleen Layman, P.E., Bechtel Power Corporation, Frederick, MD  
*Discussion Leader:* Robert Applegate, Graver Water Systems, Cranford, NJ  
*IWC Representative:* Mark Cheresnowsky, GE Water & Process Technologies, Gloucester, VA

### **Mercury Treatment in Flue Gas Desulfurization Wastewater Development Program Update**

MICHAEL PUDVAY, Degremont Technologies, Richmond, VA; ENOS L. STOVER, PhD., Stover & Associates, Inc., Stillwater, OK  
IWC-08-30

### **Full Scale Operation of Biological Technology for the Removal of Selenium from FGD Wastewaters**

JILL SONSTEGARD and TIM PICKETT, GE Water & Process Technologies, Salt Lake City, UT; JAMES HARWOOD, GE Water & Process Technologies, Oakville, ON, Canada; Danny Johnson, P.E., Progress Energy Carolinas Inc., Raleigh, NC  
IWC-08-31

**Prepared Discussion by:** BRYAN HANSEN, PE, Burns and McDonnell, Kansas City, MO

### **Duke Energy-Carolina's Strategy, Project Execution and Initial Experience**

ROBERT WYLIE and RICHARD BAKER, Duke Energy, Charlotte, NC; WILLIAM KENNEDY, Orion Engineering, PLLC, Charlotte, NC; MICHAEL RIFFE and BRIAN HEIMBIGNER, Siemens Water Technologies Corp, Warrendale, PA; TIMOTHY PICKETT, GE Water Process & Technologies, Salt Lake City, UT  
IWC-08-32

**Prepared Discussion by:** DIANE MARTINI, Sargent & Lundy, LLC, Chicago, IL

### **ZLD Systems Installed for ENEL Power Plants in Italy**

NAGESWARA RAO, Aquatech International Corporation, Canonsburg, PA; SERGIO DONADONO, ENEL, Milano, Italy  
IWC-08-33

**Prepared Discussion by:** MICHAEL PRESTON, Black & Veatch Corporation, Overland Park, KS

## **Challenges in Produced Water Treatment**

*Session Chair:* Robert Holloway, Holloway Associates, Etobicoke, ON, Canada  
*Discussion Leader:* Rudy Tamayo, Husky Energy, Calgary, AB, Canada  
*IWC Representative:* Manoj Sharma, Aquatech International Corp., Canonsburg, PA

### **Resin Cleaning of SAC and WAC Resins in SAGD - Enhanced Oil Recovery (EOR) Applications**

CLAUDE GAUTHIER, P.Eng., The Purolite Company, Burlington, ON, Canada; KEVIN DEPNER, P.Eng., EnCana Foster Creek, Bonnyville AB, Canada; MICHAEL MAYNE, BS, ChE, IX Services, Mimbres, NM  
IWC-08-34

### **Profiling and Minimization of WAC (weak acid cation) and SAC (strong acid cation) Regenerant Waste through Conductivity Recycling**

GUY MOMMAERTS, P. Eng., Ion Exchange Services (Canada) Inc., Elmira, ON, Canada; MELONIE MYSZCZYSZYN, Canadian Natural Resources Ltd., Bonnyville, AB, Canada  
IWC-08-35

**Prepared Discussion by:** SCOTT MUSSBACHER, Vista Projects, LTD, Calgary, AB, Canada; CAROLINE WILSON MUSSBACHER, P.Eng., EnCana Corporation, Calgary, Alberta, Canada

### **Alkalinity, the Joker in the Pack**

MICHAEL BRIDLE, Mibricon Ltd., Calgary, AB, Canada  
IWC-08-36

**Prepared Discussion by:** JOE BODEUX, Imperial Oil Resources, Bonnyville, AB, Canada

### **Treatment of Coal Bed Methane Produced Water Using Short Bed Ion Exchange**

MICHAEL SHEEDY and PAUL ROBINSON, Eco-Tec Inc., Pickering, ON  
IWC-08-37

## **Cooling System Optimization – The Latest in Management and Control Alternatives (I)**

**Session Chair:** David Alley, Clearwater Systems, Essex, CT  
**Discussion Leader:** Donald Johnson (D), Nalco Corporation, Naperville, IL  
**IWC Representative:** Kumar Sinha, Bechtel Power, Frederick, MD

### **Unique Cooling Water Exchanger Inspection Technique**

CHRIS FRIESEN, P.Eng., NOVA Chemicals Corporation, Red Deer, AB, Canada  
IWC-08-38

**Prepared Discussion by:** PAUL PUCKORIUS, Puckorius & Associates, Inc., Arvada, CO

### **A New Aid for Managing Biofouling in Cooling Systems**

CHARLES ASCOLESE, GE Water & Process Technologies, Port Matilda, PA  
IWC-08-39

**Prepared Discussion by:** ANDREW COOPER, Ph.D., Nalco Company, Naperville, IL  
**Author's Closure by:** CHARLES ASCOLESE, GE Water & Process Technologies, Port Matilda, PA

### **Solid Chemical Programs for Scale and Corrosion Control in Cooling Water Systems: Delivering Sustainable Development**

STEVEN BILEK, BARBARA MORIARTY, NATHANIEL GREENE, and ROBERT WALICKI, Nalco Company, Naperville, IL  
IWC-08-40

**Prepared Discussion by:** JAMES DROMGOOLE, Fortbend Services, Inc., Stafford, TX

### **Cooling Water Hardness and Chloride Reduction (A Novel Chemical Treatment)**

AL YEOMAN, CHEMICO International, Inc., Duluth, GA; SAM OWENS, CHEMICO International, Inc., Corpus Christi, TX  
IWC-08-41

**Prepared Discussion by:** AKLIMA HOSSAIN, PE, HDR|Cummins and Barnard, Inc., Ann Arbor, MI

### **Utilization of Salt Water as the Source for Make-Up Water in Wet Cooling Towers**

NATASHA JONES and LUC DE BACKER, PhD, Bechtel Power Corporation, Frederick, MD  
IWC-08-51

**Prepared Discussion by:** RAY POST, PE, ChemTreat, Inc., Glen Allen, VA

## **Ion Exchange**

**Session Chair:** Edward Nace, Rohm and Haas Company, Philadelphia, PA  
**Discussion Leader:** Peter Midgley, Christ Water Technology Americas, LLC, New Britain, CT  
**IWC Representative:** James Sabzali, Thermax Inc., Novi, MI

### **Dual Functionality Acrylic Anion Resin in a Demineraliser System - A Case Study at Interquisa Canada**

CHRISTIAN BEAULE, The Purolite Company, Paris, ON, Canada; DAVID BOULANGER, Interquisa Canada, Montreal, QC, Canada  
IWC-08-42

**Prepared Discussion by:** THOMAS SCHENDEL, Mechanical Engineering Company, Inc., Houston, TX

### **Ion Exchange Applications of Simulation Technology**

MICHAEL GOTTLIEB, ResinTech, Inc., West Berlin, NJ  
IWC-08-43

**Prepared Discussion by:** JIM SUMMERFIELD and KYLE SMITH, The Dow Chemical Company, Midland, MI – POWERPOINT  
**Author's Closure by:** MICHAEL GOTTLIEB, ResinTech, Inc., West Berlin, NJ

### **Squeezing a Few More Years of Life from a 30+ Year Old Packed Bed Demineralizer**

PETER MEYERS, ResinTech, Inc., West Berlin, NJ  
IWC-08-44

**Prepared Discussion by:** JIM SHIVERS, Ion Exchange LLC, Glendora, CA

### **Innovations in Ion-Exchange Technology for the Removal of Sulphate**

DAVID KRATOCHVIL, BRAD MARCHANT, MICHAEL BRATTY, RICK LAWRENCE, BioteQ Environmental Technologies Inc., Vancouver, BC, Canada  
IWC-08-45

**Prepared Discussion by:** PARAG DEVAL, Thermax Limited, Novi, MI,

## **Approaches to Minimizing Membrane Fouling**

**Session Chair:** Jantje Johnson, Genesys North America, Eden Prairie, MN  
**Discussion Leader:** Arun Mittal (A.), Aquatech International Corporation, Canonsburg, PA  
**IWC Representative:** Wayne Bernahl, W. Bernahl Enterprises Ltd., Elmhurst, IL

### **Comparing Conventional and Membrane Pre-Treatment on Seawater Osmosis Desalination Plants**

PAUL CHOULES, Veolia Water Solutions & Technologies, Houston, TX  
IWC-08-46

**Prepared Discussion by:** MICHAEL PRESTON, Black & Veatch Corporation, Overland Park, KS

### **Ultra Filtration Improves Performance of RO Unit Treating Cooling Tower Blow Down in a Zero Liquid Discharge (ZLD) Plant**

VENKAT JAGANNATHAN, Aquatech International Corporation, Canonsburg, PA; RAMIRO RIVERA and CARLOS ALEQUIN, AES Puerto Rico, L.P, Guayama, PR  
IWC-08-47

**Prepared Discussion by:** CRAIG COCKERHAM, Fluor Corporation, Sugar Land, TX  
**Author's Closure by:** VENKAT JAGANNATHAN, Aquatech International Corporation, Canonsburg, PA; RAMIRO RIVERA and CARLOS ALEQUIN, AES Puerto Rico, L.P, Guayama, PR

### **Auditing a Reverse Osmosis System**

JANE KUCERA, Nalco Company, Naperville, IL  
IWC-08-48

**Prepared Discussion by:** SCOTT BEARDSLEY, The Dow Chemical Company, Minneapolis, MN

## **Cooling System Optimization – The Latest in Management and Control Alternatives (II)**

*Session Chair:* William Beer, GE, Trevose, PA  
*Discussion Leader:* Aklima Hossain, PE, HDR|Cummins, Ann Arbor, MI  
*IWC Representative:* Dennis McBride, Fluor Enterprises, Inc., Greenville, SC

### **Puckorius Scaling Index as Applied to Dolphin (Pulsed Power) Non-chemical Water Treatment**

DAVID ALLEY, Clearwater Systems, Essex, CT; PAUL PUCKORIUS, Puckorius & Associates Inc., Arvada, CO  
IWC-08-49

**Prepared Discussion by:** LORRAINE HUCHLER, PE, CMC, MarTech Systems Inc., Lawrenceville, NJ

### **Defining Green Technology in Water Treatment for Cooling Water Systems**

JAMES GREEN, Heisler Green, Downers Grove, IL  
IWC-08-50

**Prepared Discussion by:** TIMOTHY EGGERT, GE Water & Process Technologies, Seal Beach, CA

### **A New Framework for the Management of Cooling System Dynamics**

DONALD JOHNSON, Nalco Corporation, Naperville, IL; GEOFF TOWNSEND, Nalco Corporation, Northwich, Cheshire, UK  
IWC-08-52

**Prepared Discussion by:** KUMAR SINHA, Bechtel Corporation, Frederick, MD

### **Design & Construction of a Riverbank Filtration Cooling Water Supply for an IGCC Station**

HENRY HUNT, Ranney Collector Wells, Columbus, OH  
IWC-08-53

**Prepared Discussion by:** COLLEEN LAYMAN, PE, Bechtel Power Corporation, Frederick, MD

## **Produced Water**

*Session Chair:* Donald Downey, Purolite Company, Paris, ON, Canada  
*Discussion Leader:* Peter Midgley, Christ Water Technology Americas, LLC, New Britain, CT  
*IWC Representative:* James Sabzali, Thermax Inc., Novi, MI

### **Innovations in Produced Water Treatment for SAGD**

DOROTHY NEU and MARK NICHOLSON, PE, Veolia Water Solutions & Technologies, Pewaukee, WI; KEITH MINNICH, PE, Veolia Water Solutions & Technologies, Calgary, AB, Canada  
IWC-08-54

### **Technical Advancements in SAGD Evaporative Produced Water Treatment**

WILLIAM HEINS, GE Water & Process Technologies, Bellevue, WA  
IWC-08-55

**Prepared Discussion by:** JASBIR GILL, PhD. Nalco Company, Naperville, IL

### **An Innovative Approach for Processing “SAGD” Produced water**

RAFIQUE JANJUA, PE, Fluor Daniel Corporation., Sugar Land, TX  
IWC-08-56

**Prepared Discussion by:** PETER MIDGLEY, Christ Water Technology Americas, LLC, New Britain, CT

## **Wastewater Treatment in Recycle/Reuse Systems**

*Session Chair:* David A. Velegol, Chester Engineers, Pittsburgh, PA  
*Discussion Leader:* Jerry L. Penland, Chester Engineers, Pittsburgh, PA  
*IWC Representative:* John T. Lucey, Jr. PE, HDR Engineering, Inc., Pittsburgh, PA

### **Unique Wastewater Processing Application at River Bend Nuclear Station**

TRACY BARKER and JIM BRAUN, AVANTech, Inc., Columbia, SC  
IWC-08-57

### **Wastewater Treatment Challenges from an Ethanol Plant Recycle System**

THOMAS LAWRY, HDR Engineering, Inc., Pittsburgh, PA  
IWC-08-58

### **Sustainable Wastewater Reuse – Water Quality Modeling for Near ZLD**

PRIT KOTECHA, Suncor Energy Inc., Fort McMurray, AB, Canada  
IWC-08-59

### **Water Conservation at Lindsay Olive Growers**

NAOMI LEVY, Infilco Degremont Technologies, Richmond, VA  
IWC-08-60

## Commissioning High Pressure Power Plants

**Session Chair:** Robert Bartholomew, Sheppard T. Powell Associates LLC, Baltimore, MD  
**Discussion Leader:** William Moore, Fluor Corporation, Sugar Land, TX  
**IWC Representative:** Michael Gottlieb, ResinTech, West Berlin, NJ

### **Challenges in Meeting Condensate, Feedwater, and Steam/Water Quality Limits during Startup and Commissioning of Multi Pressure Combined Cycle Power Plants-EPC Perspective**

CHRISTOPHER HUTH, Bechtel Power Corporation, Frederick, MD; KUMAR SINHA, PE, Bechtel Power Corp., Frederick, MD  
IWC-08-61

**Prepared Discussion by:** WILLIAM MOORE, Fluor Enterprises, Inc., Sugar Land, TX

JOSEPH E SCHROEDER, Nooter/Eriksen St. Louis, MO

ROBERT BARTHOLOMEW, Sheppard T. Powell Associates, LLC, Baltimore, MD

**Authors' Closure by:** CHRISTOPHER HUTH, Bechtel Power Corporation, Frederick, MD; KUMAR SINHA, PE, Bechtel Power Corp., Frederick, MD

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## **Advances in Refinery Wastewater Treatment**

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

### **Oil / Water Separation Techniques Applied to Circular Designs**

TYSON GOLLAHER, PE and JIM WOODS, WesTech Engineering, Inc, Salt Lake City, UT; RICK SZILAGYI, WesTech Engineering, Inc., Chicago, IL  
IWC-08-63

### **Storage Tank Internal Floating Roofs Description and Selection Guidelines**

MICHAEL DOXEY, PE, HMT Inc., Tomball, TX  
IWC-08-64

**Prepared Discussion by:** DONALD VACKER, Bechtel Corporation, Houston, TX

### **Integrated Fixed-Film/ Activated Sludge (IFAS) for Refinery and Petrochemical Wastewater Treatment Plant Upgrades**

CASEY MUELLER and RUSS GRILLO Frontier Refining, Inc., Cheyenne, WY; RAMESH KALLURI, Kalluri Group, Inc., Houston, TX ; SARAH HUBBELL and WAYNE FLOURNOY, Entex Technologies, Inc., Chapel Hill, NC  
IWC-08-65

### **Evaluating Impacts of FCCU Scrubber Purge Water Discharges on Refinery Biological Treatment**

FRANK CASTALDI, Brown and Caldwell, Austin, TX; JEFF ALLEN, P.E., Brown and Caldwell, Saint Paul, MN  
IWC-08-66

**Prepared Discussion by:** JAMES DROMGOOLE, Fortbend Services, Inc., Stafford, TX  
**Authors' Closure by:** FRANK CASTALDI, Brown and Caldwell, Austin, TX; JEFF ALLEN, P.E., Brown and Caldwell, Saint Paul, MN

## **Recycle/Reuse Alternatives for POTW Applications**

*Session Chair:* Ralph A. Finizio, Pepper Hamilton LLP, Pittsburgh, PA  
*Discussion Leader:* Christopher Howell, Crown Solutions, Vandalia, OH  
*IWC Representative:* Bradley Wolf, Navigant Consulting, Pittsburgh, PA

### **Keeping it Green at the Landfill - Cogeneration, Evaporation and Membrane Technology for the Treatment of Landfill Leachate**

CRISTINA DEL PICCOLO, Led Italia srl., Zoppola, PN, Italy; TINA MASTERS ODUM, P.E. Crown Solutions, Vandalia, OH  
IWC-08-67

**Prepared Discussion by:** BRIAN AYLAIAN, Metcalf & Eddy/AECOM, Laurel, MD

### **Design Considerations for Upgrading POTWs to Treat Power Plant Wastewater Discharges**

BRIAN AYLAIAN and HONG YIN, Metcalf & Eddy/AECOM, Laurel, MD  
IWC-08-68

**Prepared Discussion by:** CHRISTIAN CABRAL, NA Water Systems, Pittsburgh, PA

### **Technical Assessment of Water Reuse in Consideration of Emerging Pollutants**

CHRISTOPHER STACKLIN, PE and JERRY EVANGELISTA, PE, Orange County Sanitation District, Fountain Valley, CA  
IWC-08-69

**Prepared Discussion by:** ALFONSO SALINAS, Crown Solutions, Vandalia, OH

**Authors' Closure by:** CHRISTOPHER STACKLIN, PE and JERRY EVANGELISTA, PE, Orange County Sanitation District, Fountain Valley, CA

### **Water Conservation Strategies at Electric Generating Stations**

Andrew Markle, P.Eng., MPR Associates Inc., Alexandria, VA  
IWC-08-70

**Prepared Discussion by:** JOHN LUCEY, HDR Engineering, Pittsburgh, PA      POWERPOINT

## **Zero Liquid Discharge (ZLD) Technologies and Applications**

**Session Chair:** Brian Powers, Fluor Power Group, Charlotte, NC  
**Discussion Leader:** Devesh Mittal, Aquatech International Corporation, Stafford, TX  
**IWC Representative:** Dennis McBride, Fluor Enterprises, Inc., Greenville, SC

### **Achieving Reliable Zero Liquid Discharge (ZLD) Treatment of Gray Water at a Integrated Gasification Combined Cycle (IGCC) Power Plant**

LANNY WEIMER, CAROLINA GONZALEZ, and ROBERT SOLOMON, GE Water & Process Technologies, Ellicott City, MD  
IWC-08-71

**Prepared Discussion by:** WILLIAM MOORE, Fluor Enterprises, Inc., Sugar Land, TX

### **Evaporation of Wastewaters Containing Highly Soluble Salts**

WILLIAM SHAW, P.E., HPD, LLC, a Veolia Water Solutions & Technologies Company, Pewaukee, WI  
IWC-08-72

**Prepared Discussion by:** MICHAEL PRESTON, Black & Veatch Corporation, Overland Park, KS

### **Navajo Generating Station – 25 Years of Zero Liquid Discharge (ZLD)**

ROBERT PETERSON and JERRY KOGER,, Salt River Project, Page, AZ; TIMOTHY RITTOF, HPD, LLC, Plainfield, IL  
IWC-08-73

**Prepared Discussion by:** MICHAEL WISDOM, P. E., ContourGlobal, Houston, TX

### **Use of High Efficiency Reverse Osmosis (HERO), Brine Concentration and Crystallization at the World's First Two Zero Liquid Discharge (ZLD) Ethanol Plants**

RUSSELL VANDENBERG and NIMAI MILLER , GE Water & Process Technologies, RCC Thermal Products, Bellevue, WA; ,WILLIAM MCCLAIN, GE Water & Process Technologies, Phoenix, AZ.  
IWC-08-74

**Prepared Discussion by:** ARUN MITTAL, Aquatech International Corporation, Canonsburg, PA

## Trace Contaminant Removal

*Session Chair:* David Smith, Calgon Carbon Corporation, Pittsburgh, PA  
*Discussion Leader:* Anthony DeCola, LANXESS Sybron Chemicals Inc., Pittsburgh, PA  
*IWC Representative:* Craig Brown, Chemionex, Pickering, Ontario, Canada

### **Porous Polymers Via Macroreticular Synthesis: Nature and Applications**

ROBERT ALBRIGHT, PhD, Albright Consulting, Southampton, PA  
IWC-08-75

**Prepared Discussion by:** BILL ZAVORA, PE, Calgon Carbon Corporation, Santa Fe Springs, CA

### **Trace Contaminant Removal from Ground and Waste Waters with Selective and Non-Selective Media**

ROBERT GOLTZ, PhD, Dow Chemical, Midland, MI  
IWC-08-76

**Prepared Discussion by:** PETER RITCHEY, Severn Trent Water Purification, Inc., Pittsburgh, PA



*The Conference on Industrial Water*

## **OFFICIAL PROCEEDINGS**

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October 4-8, 2009

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## Industrial Wastewater Treatment

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

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

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

### **How A Media Filter, With Sustainable “Green” Media, and Innovative Media Regeneration Design, solved 3 Major Process Water Problems at a U.S. Aluminum Mill**

JOE HALIGOWSKI, Filtra Systems Company, Farmington Hills, MI

IWC-09-01

**Prepared Discussion by:** JOHN SCHUBERT, PE, HDR, Pittsburgh, PA

**Authors’ Closure by:** JOE HALIGOWSKI, Filtra Systems Company, Farmington Hills, MI

### **Three-Phase Mining Effluent Treatment Plant To Meet Stringent Standards**

CHRISTOPHER HOWELL and DAVE CHRISTOPHERSEN, Crown Solutions Co., LLC – a Veolia Water Solutions & Technologies Company, Vandalia, OH

IWC-09-02

**Prepared Discussion by:** ANDREW STERN, Chester Engineers, Charleroi, PA

### **MBBR Technology Provides Easy Upgrade for Mature Landfill Treatment Systems**

CHRISTIAN CABRAL, EVA SANTOS, MARK SMOCK, and WILLIAM KELLY, N.A. Water Systems, a Veolia Water Solutions & Technologies Company, Vandalia, OH

IWC-09-03

**Prepared Discussion by:** JERRY PENLAND, Chester Engineers, Moon Township, PA

**Authors’ Closure by:** CHRISTIAN CABRAL, EVA SANTOS, MARK SMOCK, and WILLIAM KELLY, N.A. Water Systems, a Veolia Water Solutions & Technologies Company, Vandalia, OH

## Trace Contaminant Removal

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

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

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

### Evaluation of Treatment Techniques for Selenium Removal

FREDRICK W. VANCE, PhD and KYLE SMITH, Dow Water and Process Solutions; Midland, MI; ANTONIO O. LAU, PhD, Infilco Degremont Inc, Richmond, VA

IWC-09-05

**Prepared Discussion by:** CLAUDE GAUTHIER, P.Eng., The Purolite Company, Paris, ON, Canada

### Patent Pitfalls: Why Calgon and Clearwater Patents Failed, and How to Avoid Similar Outcomes

CLIFTON MCCANN and CHRISTOPHER CROOK, Venable LLP, Washington, DC

IWC-09-06

**Prepared Discussion by:** RICHARD POSA and JOHN WALISZEWSKI, SAMCO Technologies, Inc., Buffalo, NY

## Wastewater Reuse / Recycle in the Food & Beverage Industry

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

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

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

### Biological Treatment Solves Fruit Processor's Discharge Dilemma

SHASHI GORUR, Siemens Water Technologies, Warrendale, PA; ROBERT MILLER, Mariani Packing Co., Inc., Vacaville, CA

IWC-09-07

**Prepared Discussion by:** BRIAN FLYNN, PE, BCEE, MRE Associates, Austin, TX

### Sustainable Reuse of Wastewater and Biosolids for Agriculture in the Manchay District of Lima Peru

ANTON CALLERY, ITT Water & Wastewater S.A., Callao, Lima, Peru

IWC-09-08

**Prepared Discussion by:** BRENT COWAN, CSC Technology, Inc., Coatesville, PA

### Biological Nitrogen Removal from Cheese Plant Wastewater Using an Alternate Carbon Source

PAMELA EDRICH, ERIC BLUMENSTEIN, and PAUL PIGEON, Golder Associates Inc., Denver, CO; JOE MIDDLEBROOKS, Independent Consultant, Superior, CO; SHELDON KNAPP and DOUGLAS PETTINGER, Glanbia Foods, Gooding, ID

IWC-09-09

**Prepared Discussion by:** MICHAEL PUDVAY, Infilco Degremont, Inc., Richmond, VA

## **Field Data/Case Studies of Membrane Technologies: UF, MBR, EDI, RO**

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

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

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

### **Instrumentation and Controls Necessary to Properly Monitor Reverse Osmosis Systems**

JOSEPH VANDEHEY, Burkert Fluid Control Systems, Irvine, CA

IWC-09-10

**Prepared Discussion by:** JANE KUCERA, Nalco Company, Naperville, IL

### **Case History of a Water Treatment System in Puerto Rico**

STEVEN GAGNON and JEFF HARTMAN, AVANTech, Inc., Columbia, SC

IWC-09-11

**Prepared Discussion by:** JONATHAN WOOD, Siemens Water Technologies, Lowell, MA

### **Prevention of Calcium Phosphate Fouling in Waste Water Re-use RO plant.**

STEPHEN P. CHESTERS, FERNANDO DEL VIGO, and EDWARD DARTON, Genesys International Limited, Winsford Cheshire, UK

IWC-09-12

**Prepared Discussion by:** GREGG POPPE and SCOTT BEARDSLEY, The Dow Chemical Company, Minneapolis, MN

### **Use of Unique Fractional Electro Deionization in Power Plant Application**

DEVESH MITTAL and VJ NATHAN, Aquatech International Corporation, Canonsburg, PA; NARENDER SINGH BISHT, Aquatech Systems Asia, Pune, India

IWC-09-13

**Prepared Discussion by:** BILL LOYD, The Dow Chemical Company, Minneapolis, MN

### **The Hybrid Ceramic Membrane System in WTP**

BUM-SOO CHOI, LEE SOO YOON, and DONG SUN SHIN, Kwater, Daejeon, South Korea

IWC-09-14

## Application of Water Treatment Technologies to Operating and Nuclear Plants

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

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

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

### Well, How Long is it Gonna Take?

AMARDEEP VENUS KAUR, Southern California Edison, Westminster, CA

IWC-09-15

### Cycle Chemistry Challenges Facing the New Generation of Nuclear Power Facilities

EARNESTINE JOHNSON, JEANETTE SHOEMAKER, CHRISTOPHER HUTH, and KUMAR SINHA, Bechtel Power Corporation, Frederick, MD

IWC-09-16

**Prepared Discussion by:** RONALD M. HORN, GE Energy and SANDY SCHEXNAILDER, GE Water & Process Technologies, Dallas, TX

**Author's Closure by:** EARNESTINE JOHNSON, JEANETTE SHOEMAKER, CHRISTOPHER HUTH, and KUMAR SINHA, Bechtel Power Corporation, Frederick, MD

### Meeting Environmental Aquatic Challenges for the Next Generation of Nuclear Plant Construction

RAYMOND POST, PE, RICHARD TRIBBLE, and HELEN CERRA, ChemTreat, Inc., Glen Allen, VA; TONY BANKS, Dominion Virginia Power, Glen Allen, VA

IWC-09-17

**Prepared Discussion by:** COLLEEN LAYMAN, PE, Bechtel Power Corporation, Frederick, MD

## Current Trends in Refinery Wastewater Treatment

**Session Chair:** Ramesh Kalluri, PE, Kalluri Group, Inc., Houston, TX

**Discussion Leader:** Donald Vacker, PE, Bechtel Corporation, Houston, TX

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

### **Selenium Removal from Refinery Wastewater**

AVIJIT DEY, PhD and RAJENDRA KULKARNI, Bechtel Corporation, Houston, TX

IWC-09-18

### **Circular API Separators in Refinery Service**

MIKE BRADFORD and SHAUN KUSEK, PhD, Jacobs Consultancy Inc., Houston, TX

IWC-09-19

### **Oil-In-Water Fluorescence Sensor in Wastewater Applications**

VADIM MALKOV, PhD, Hach Company, Loveland, CO; DR. DIETMAR SIEVERT, Hach Lange GmbH, Duesseldorf, Germany

IWC-09-20

### **Refinery and Heavy Oil Production Wastewater Recycle and Reuse**

MIKE BRADFORD, Jacobs Consultancy, Houston, TX; IAN BUCHANAN, Jacobs Consultancy Canada, Calgary, Canada; IAN MOORE, Jacobs Consultancy UK Ltd, London, England

IWC-09-21

### **Refinery Wastewater Treatment using Heavy Canadian Crude for Feed Stock**

RAFIQUE JANJUA, Fluor Corporation, Sugar Land, TX

IWC-09-22

## **Semi-Conductor / High Purity Water / Ultrapure Water (Pharma/Electronics)**

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

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

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

### **Technology Selection Tools for Boiler Feedwater Applications**

ROCH LAFLAMME, GE Water and Process Technologies, Trevose, PA; ROBERT GERARD, GE Water and Process Technologies, Surhuisterveen, Netherlands

IWC-09-23

**Prepared Discussion by:** GREGORY OSEN, Christ Water Technology Americas, LLC, New Britain, CT

**Authors' Closure by:** ROCH LAFLAMME, GE Water and Process Technologies, Trevose, PA;  
ROBERT GERARD, GE Water and Process Technologies, Surhuisterveen, Netherlands

### **Contaminant Reduction by Ozone Treatment in a Pharmaceutical Water Application**

ANDREW COLLENTRO, Water Consulting Specialists, Inc., Doylestown, PA

IWC-09-24

**Prepared Discussion by:** BARBARA SCHILLING, Degremont Technologies, Elmwood Park, NJ

## Zero Liquid Discharge (ZLD) Solutions

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

*Discussion Leader:* Patricia M. Scroggin, PE, Burns & McDonnell, Kansas City, MO

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

### **Achieving the First Zero Liquid Discharge (ZLD) Treatment of Salty Wastewater and Ammonium Sulfate for the Coal Liquefaction Industry in China**

BRUCE KASNITZ, GREGG WILSON, and ROBERT SOLOMON, GE Water and Process Technologies, Bellevue, WA

IWC-09-25

**Prepared Discussion by:** DIANE MARTINI, Sargent & Lundy, LLC, Chicago, IL

### **Zero Liquid Discharge at General Motors San Luis Potosi Automotive Complex**

LAWRENCE V. KRZESOWSKI, General Motors, Warren, MI; LNSP NAGGHAPPAN and DAVID E. PARKER, N.A. Water Systems, a Veolia Water Solutions & Technologies Company, Moon Township, PA

IWC-09-26

**Prepared Discussion by:** DAVID VELEGOL, Jr., Chester Engineers, Moon Township, PA

**Author's Closure by:** LAWRENCE V. KRZESOWSKI, General Motors, Warren, MI; LNSP NAGGHAPPAN and DAVID E. PARKER, N.A. Water Systems, a Veolia Water Solutions & Technologies Company, Moon Township, PA

### **Evaluation of RO, Organic Trap, and Carbon Filter for Organic Removal from a Distillate Feed Water: A Case Study from a Zero-Liquid Discharge Power Plant with Surface and Reclaimed Water Sources for Cooling**

EMMANUEL QUAGRAINE, PhD, Shand Power Station, SaskPower, Estevan, SK, Canada; KEITH HILL and FREDRICK OMOROGBE, Saskatchewan Power Corporation, SK, Canada

IWC-09-27

**Prepared Discussion by:** K. ANTHONY SELBY, Water Technology Consultants, Inc., Evergreen, CO

**Authors' Closure by:** EMMANUEL QUAGRAINE, PhD, Shand Power Station, SaskPower, Estevan, SK, Canada; KEITH HILL and FREDRICK OMOROGBE, Saskatchewan Power Corporation, SK, Canada

## **HRSG & Boiler Tube Failure (BTF) Mechanisms, Analyses, & Corrective Measures, Presentations & Panel Discussion Sponsored by the ASME Research and Technology Committee**

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

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

### **The Impact of Feedwater and Condensate Return Excursions on Boiler System Component Failures**

MEL ESMACHER, PE, GE Water & Process Technologies, The Woodlands, TX; ANTHONY ROSSI, GE Water & Process Technologies, Trevose, PA

IWC-09-28

### **HRSG FAC**

BILL BOYD and MARK VOGT, Dynegy Generation, O'Fallon, IL

IWC-09-29

### **Oxygen Corrosion and Corrosion Fatigue Boiler Tube Failure Case Histories**

EWA LABUDA and ROBERT BARTHOLOMEW, Sheppard T. Powell Associates, LLC, Baltimore, MD

IWC-09-30

### **A Review of Hydrogen Damage and Phosphate Gouging Corrosion Mechanisms**

DAVID DANIELS, M&M Engineering Associates Inc., Austin, TX

IWC-09-31

### **Panel Discussion Transcript**

*This transcript has been prepared by the International Water Conference (IWC) from a panel discussion. It is as accurate as we can reasonably make it, but errors may exist. The authors have not had the opportunity to review the transcript or correct it. Neither, the IWC, the authors, nor the companies which they represent assume any liability for the use of the information in this transcript. The opinions expressed were presented to facilitate discussion and are not necessarily those of the presenters, their employers, or the IWC.*

## **Water & Wastewater Management in Power Plant FGD Systems – Part I**

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

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

### **Source Water Challenges from Three FGD Makeup Water Treatment Systems**

THOMAS LAWRY, HDR Engineering, Inc, Pittsburgh, PA

IWC-09-32

**Prepared Discussion by:** MILTON OWEN, URS Corporation, Austin, TX

### **Monitoring the Chloride Level in Wet FGD Absorbers with an On-line Conductivity Transmitter**

JOHN J. KIM, PE, PhD, JJK Water Technology, Inc., Huntersville, NC; ROBBIN M. JOLLY, Duke Energy Corp, Belmont, NC

IWC-09-33

**Prepared Discussion by:** COREY TYREE, PhD, Southern Company Services, Birmingham, AL

### **Intercomparison of Different Technologies for the Quantitation of Total Mercury in Complex Waste Streams**

RUSSELL GERADS and JACOB MEYER, Applied Speciation and Consulting, LLC, Tukwila, WA

IWC-09-34

**Prepared Discussion by:** FREDERICK W. VANCE, PhD, Dow Water & Process Solutions, Midland, MI

### **Trace Mercury Removal from Flue Gas Desulfurization Wastewater**

MARK OWENS, PE, Degremont Technologies, Richmond, VA; H. ROBERT GOLTZ, PhD, The Dow Chemical Company, Midland, MI; DEAN MINGEE and ROBERT KELLY, PhD, Degremont North American Research & Development, Richmond, VA

IWC-09-35

**Prepared Discussion by:** WILLIAM M. KENNEDY, PE, Orion Engineering, PLLC, Charlotte, NC

## Produced Water

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

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

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

### Steam Generation Using Produced Water: Lessons Learned

MARTIN GODFREY, Nalco Company, Naperville, IL

IWC-09-36

**Prepared Discussion by:** MELONIE MYSZCZYSZYN, Canadian Natural Resources Ltd., Bonnyville, AB, Canada

### SAGD Fit-for-Purpose Boiler Feedwater Specification from Evaporator Distillate

KEITH MINNICH, PE, VWS Oil & Gas, Calgary, AB, Canada; DOROTHY NEU, Veolia Water Solutions & Technologies/HPD, Pewaukee, WI; J. LUKE DRONE, Veolia Water Solutions & Technologies/HPD, Plainfield, IL  
IWC-09-37

**Prepared Discussion by:** SUDHIR PARAB, ConocoPhillips Canada Limited, Calgary, AB, Canada

**Author's Closure by:** KEITH MINNICH, PE, VWS Oil & Gas, Calgary, AB, Canada; DOROTHY NEU, Veolia Water Solutions & Technologies/HPD, Pewaukee, WI; J. LUKE DRONE, Veolia Water Solutions & Technologies/HPD, Plainfield, IL

### A Case Study: Process Evaluation, Design, Construction, and Start-up of a Produced Water Treatment Plant in Equatorial Guinea, Africa

BRIAN HUFF and ERIC BLUMENSTEIN, Golder Associates Inc., Lakewood, CO

IWC-09-38

**Prepared Discussion by:** KEVIN DRAKE, AMEC BDR LIMITED - Calgary, AB, Canada

## Improving Sustainability through Water Reuse and Conservation

*Session Chair:* Colleen Layman, PE, Bechtel Power Corporation, Frederick, MD

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

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

### **Innovative Water Reuse: Sustainable Water Management and Conservation Using Advanced (Hybrid) Cooling Technologies**

PETER DEMAKOS, PE and CHRIS IMIOLA, Niagara Blower Heat Transfer Solutions, Buffalo, NY  
IWC-09-39

**Prepared Discussion by:** JEFF MALLORY, Sargent & Lundy, LLC, Chicago, IL

### **Innovative Ion Exchange Systems for Cost-Effective Increase in Water Re-use in Power Plants**

MICHAEL BRATTY, DAVID KRATCHOVIL, DAVID SANGUINETTI, SONGLIN YE, and TERYL MURRAY, BioteQ Environmental Technologies Inc., Vancouver, BC, Canada  
IWC-09-40

**Prepared Discussion by:** STEPHEN DOMINICK, Siemens Water Technologies Corp., Chicago, IL

### **Toxic Dissolved and Dispersed Hydrocarbon Removal in Industrial Wastewater and Groundwater Treatment and Reuse with the Macro Porous Polymer Extraction Technology**

DICK MEIJER, VWS Oil & Gas / MPP Systems, Veolia Water Solutions & Technologies, Ede, The Netherlands;  
KENNETH SEVERING, Whittier Filtration, Veolia Water Solutions & Technologies, Santa Fe Springs, CA  
IWC-09-41

**Prepared Discussion by:** EDWARD CARR, Buckman USA, St. Louis, MO

## **Aspects of Cycle Chemistry Control in Fossil-Fueled Steam Generation Systems, a Panel Discussion Sponsored by the ASME Research and Technology Committee**

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

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

### **The Impact of Oxidizing Environment on Feedwater Corrosion and Metal Transport - New Tools and Findings**

DANIEL C. SAMPSON, Nalco Company, Vallejo, CA; JAMES MOEN, Roseville Energy Park, Roseville, CA  
IWC-09-42

### **Real-time Corrosion Product Transport Monitoring Using On-line Particle Monitors**

JOE ZIMMERMAN, CHEMTRAC Systems, Inc, Norcross, GA  
IWC-09-43

### **Cycle Chemistry Programs and Control in High and Medium Pressure Boilers**

K. ANTHONY SELBY, Water Technology Consultants, Inc., Evergreen, CO  
IWC-09-44

### **Organic Chemical Treatment of High Purity Boiler Feedwater – Advantages and Limitations**

JAMES ROBINSON, ROBIN KLUCK, and ANTHONY ROSSI, GE Water and Process Technologies, Trevose, PA; LUIS CARVALHO, GE Water and Process Technologies, Mississauga, ON, Canada  
IWC-09-45

### **Panel Discussion Transcript**

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## Cooling Water Reuse/Energy Conservation

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

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

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

### **The Impact of Water Reuse on Industrial Open Evaporative Cooling Systems**

PETER ELLIOTT, GE Water & Process Technologies, Trevose, PA

IWC-09-46

### **An Update of Reuse Water Experiences in Cooling Tower Water Systems**

PAUL R. PUCKORIUS, Puckorius & Associates, Inc., Arvada, CO

IWC-09-47

**Prepared Discussion by:** JAMES DROMGOOLE, Fort Bend Services, Inc., Stafford, TX

### **Application Study on An Electrolytic Softening Reactor for The Removal of Calcium Hardness in Cooling Tower Water Systems**

JEON SOO MOON, JAE KUEN LEE, and PYL YANG PARK, Korea Electric Power Research Institute, Daejeon, Korea

IWC-09-48

**Prepared Discussion by:** ARTHUR FREEDMAN, PhD, Arthur Freedman Associates, Inc., East Stroudsburg, PA

## **Water & Wastewater Management in Power Plant FGD Systems – Part II**

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

**Discussion Leader:** Colleen Layman, PE, Bechtel Power Corporation, Frederick, MD

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

### **A Zero Liquid Discharge Process for Boron Recovery from FGD Wastewater**

H. ROBERT GOLTZ, PhD and CHRIS EICHER, The Dow Chemical Company, Midland, MI; NAOMI LEVY, Infilco Degremont, Inc., Richmond, VA

IWC-09-49

**Prepared Discussion by:** ROBERT L. HAMILTON, PE, Hamilton Engineering, Inc., Denver, CO

### **Evaluating Biological Treatment Technologies for the Removal of Mercury, Selenium, and Other Trace Metals in FGD Blowdown Waters**

ERIC BLUMENSTEIN, KEVIN CONROY, and JIM GUSEK, Golder Associates, Inc, Lakewood, CO

IWC-09-50

**Prepared Discussion by:** F. DAVID FITZGERALD, PE, Progress Energy (Contract), Raleigh, NC

### **ZLD Achieved for the Treatment of FGD Waste Water at Iatan Station**

GREG MANDIGO, Aquatech ICD, Hartland, WI

IWC-09-51

### **New Low Temperature ZLD Process**

WILLIAM SHAW, PE, HPD, LLC, a Veolia Water Solutions & Technologies Company, Pewaukee, WI

IWC-09-52

**Prepared Discussion by:** THOMAS E. HIGGINS, PhD, PE, CH2M Hill, Chantilly, VA

## Recovery & Reuse of Produced Water

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

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

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

### Reuse of Water for Once Through Applications in Oil Sand

JASBIR GILL, PhD, Nalco Company, Naperville, IL

IWC-09-53

**Prepared Discussion by:** DOROTHY NEU, HPD/Veolia Water Solutions & Technologies, Pewaukee, WI

### Treatment of Oilfield Produced Water for Industrial Reuse

PETER LEMKE and KEVIN CONROY, Golder Associates Inc., Denver, CO; ISAAC JURAWAN, PE, T.N.

Ramnauth & Co. Ltd., Penal, Trinidad, W.I.

IWC-09-54

**Prepared Discussion by:** MILIND KULKARNI, Hatch & Associates, Calgary, AB, Canda

### Optimization of SAGD Produced Water Evaporator Design and Impacts on Blowdown Disposal Options

NATHAN HARALSON, GREGG WILSON, and WILLIAM HEINS, GE Water & Process Technologies, Bellevue, WA

IWC-09-55

### Produced Water Recycle Reuse at the Oman Mukhaizna Oil Field

DAN BJORKKLUND, Aquatech International Corporation, Hartland, WI

IWC-09-56

## Cooling Water New Technologies

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

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

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

### **Automated Feed of New Oxidizing Biocide Provides "Best Practice" in Delivery of Chlorine Dioxide to Small-scale Systems**

JOHN W. BYRNE and RICHARD MCCAFFREY, BASF Catalysts, LLC, Iselin, NJ; KEITH HIRSCH, BASF Corporation, Wyandotte, MI  
IWC-09-57

**Prepared Discussion by:** GEORGE DIMOTSIS, Dripping Wet Water, Inc., Boerne, TX

**Authors' Closure by:** JOHN W. BYRNE and RICHARD MCCAFFREY, BASF Catalysts, LLC, Iselin, NJ; KEITH HIRSCH, BASF Corporation, Wyandotte, MI

### **Cost-Effective New Liquid Halogen Biocide with Better Performance and Reduced Corrosivity**

SANG-HEA SHIM, Justeq LLC, Northbrook, IL  
IWC-09-58

**Prepared Discussion by:** DAVE CHRISTOPHERSEN, Crown Solutions, a subsidiary of Veolia Water Solutions & Technologies, Vandalia, OH

### **EPA Rule 316b - Compliant Passive Intake System for Cooling Water Supply**

HENRY HUNT, Ranney Collector Wells, Columbus, OH  
IWC-09-59

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

### **A Field Evaluation of Chemical and Pulsed Power Water Treatment**

MICHAEL PATTON and DAVID ALLEY, Clearwater Systems Corporation, Essex, CT  
IWC-09-60

**Prepared Discussion by:** LORAIN HUCHLER, PE, CMC, MarTech Systems, Inc., Lawrenceville, NJ

### **Beyond "Green Technology": Optimizing Energy Efficiency and Environmental Performance in Cooling Water Treatment**

MARY GLASS, Mexel USA, LLC, Arlington, VA; DENNIS HUNTER YANKEE, Tennessee Valley Authority, Knoxville, TN  
IWC-09-61

**Prepared Discussion by:** AL NEBRIG, Southern Company Generation, Birmingham, AL

**Authors' Closure by:** MARY GLASS, Mexel USA, LLC, Arlington, VA; DENNIS HUNTER YANKEE, Tennessee Valley Authority, Knoxville, TN

## **Ion Exchange Technology**

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

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

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

### **The Improvement of Thermal Stability of Strong-acid Cation Exchange Filter and Their Decomposition Mechanism**

SHOJI AOKI, JUNICHI KANNO, and HIDEO KAWAZU, Ebara Clean Environment Co., Ltd., Fujisawa, Kanagawa, Japan; MAKOTO KOMATSU, Ebara Corporation, Ohta-ku, Tokyo, Japan  
IWC-09-62

**Prepared Discussion by:** GEORGE CRITS and WILLIAM RUNYAN, Idreco USA, West Chester, PA

### **Selective Silica Removal**

PETER MEYERS, ResinTech, Inc., West Berlin, NJ  
IWC-09-63

**Prepared Discussion by:** LYLE KIRMAN, Tangent Company, LLC, Chagrin Falls, OH

### **Selective Removal of Ammonia and Nitrate from Cooling Tower Water by Functional Adsorbents**

SHIRISH NAIK, SHARDUL KSHIRSAGAR, R. PARASHTEKAR, S KRISHNAN, and KIRAN DESHPANDE, Thermax Ltd, Bhosari, Pune, India  
IWC-09-64

**Prepared Discussion by:** ROBERT FERGUSON, French Creek Software, Inc., Kimberton, PA

## On Line Monitoring (Analytical)

**Session Chair:** Bob Bryant, Chemtrac Systems, Atlanta, GA

**Discussion Leader:** Ralph Finizio, Pepper Hamilton LLP, Pittsburgh, PA

**IWC Representative:** Wayne Bernahl, W. Bernahl Enterprises Ltd., Elmhurst, IL

### **Application of New Boiler Scale and Corrosion Control Automation Technology**

CHRISTINA FLEMING and JOHN OSTBERG, Nalco Company, Naperville, IL

IWC-09-65

**Prepared Discussion by:** JOHN VOGT, Chemtreat, Inc, Glen Allen, VA

### **Evaluating On-Line High Purity Water Oxidation Reduction Potential Analysis for Boiler Feedwater Quality**

VICKIE OLSON, Honeywell Field Solutions, Atlanta, GA; JODIRAH GREEN, Progress Energy Carolinas Inc., Roxboro, NC

IWC-09-66

### **Development of An On-line Corrosion Product Monitoring System Using LIBD Technology**

JEON SOO MOON, PYL YANG PARK, and JAE KUEN LEE, Korea Electric Power Research Institute, Daejeon, Korea

IWC-09-67

**Prepared Discussion by:** CLAUDE GAUTHIER, P.Eng., The Purolite Company (Canada), Paris, ON, Canada

### **Advances in Analytical Techniques for Selenium Speciation Analysis and Their Application for Characterization of Selenium in Wastewater**

HAKAN GURLEYUK and RUSSELL GERADS, Applied Speciation and Consulting, LLC, Tukwila, WA

IWC-09-68

## Power Plant Applications

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

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

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

### **There is a Hurricane Coming - How Do I prepare my Power Plant?**

CHRISTOPHER VOTAVA, Cottonwood Energy, Deweyville, TX; J.C. DROMGOOLE, Fort Bend Services, Stafford, TX

IWC-09-69

**Prepared Discussion by:** ROGER LIGHT, The Dow Chemical Company, Freeport, TX

### **Optimizing Chemical Treatment of Condensate Systems in Industrial Plants - Tools, Methods, and Strategies**

ROBIN W. KLUCK and JAMES ROBINSON, GE Water and Process Technologies, Trevose, PA

IWC-09-70

**Prepared Discussion by:** IRVIN J. COTTON, Arthur Freedman Associates, Newport, RI

**Authors' Closure by:** ROBIN W. KLUCK and JAMES ROBINSON, GE Water and Process Technologies, Trevose, PA