

**International Ozone Association
Pan American Group Annual
Conference 2001**

Advances in Ozone Technology

**Newport Beach, California, USA
5-9 May 2001**

ISBN: 978-1-61738-531-5

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2001) by the International Ozone Association
All rights reserved.

Printed by Curran Associates, Inc. (2010)

For permission requests, please contact the International Ozone Association
at the address below.

International Ozone Association
P.O. Box 28873
Scottsdale, AZ 85255 USA

Phone: 1.480.529.3787
Fax: 1.480.473.9068

infO3zone@io3a.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

SESSION 1 – OPENING GENERAL SESSION

Removal and Production of Taste and Odors by Ozonation	1
<i>I. H. (Mel) Suffet, K. Wiesenthal, G. Crozes, T. Chen, K. Atasi, A. Bruchet</i>	

SESSION 2 – IMPROVING OZONE SYSTEM EFFICIENCY

Method for Increasing Ozone Concentration	19
<i>Robert Ferrell, Arthur Shirley, Ravi Jain</i>	

SESSION 3 – DISINFECTION

Optimizing Ozone Disinfection Credit Calculations to Enhance Process Control	30
<i>Glenn Hunter, Kerwin Rakness, Pat Russell, Glen Gifford</i>	
Advancements in Ozone Disinfection as Applied at the Mount Desert Water District	44
<i>Ron Hidu, Ronald Jordan</i>	
The Impact of Underestimating Dissolved Ozone Residual Using Standard Methods 4500-Ozone and Outdated Indigo	64
<i>Kerwin Rakness, Gil Gordon, David Rexing, Eric Wert, Mark Tremel, Bernie Bubnis</i>	

SESSION 4 – BROMATE FORMATION AND CONTROL

Evaluation of Seasonal Water Quality Changes on Bromate Formation	78
<i>Mark Williams, Bradley Coffey, Stuart Krasner</i>	
Bromate Formation and Control During Ozonation Through a Static Mixer Under Varying Water Quality Conditions	93
<i>Mysore Chandrakanth, Jérôme Leparc, Don Christie, Gary Stolarik</i>	
Offsetting Ammonia Addition for Bromate Mitigation with Biological Filtration	107
<i>Ron Zegers, David Rexing, Eric Wert, Jeff Neemann, Bob Hulsey, Bruce Long</i>	
Evaluation of Various Bromate Control Strategies When Ozonating Colored Groundwater	125
<i>Tai Tseng, Ed Means, Diana Leach</i>	
Evaluation of Chlorine Dioxide and Ozone for Control of Disinfection By-Products in a Full-Scale Demonstration	138
<i>Holly Shorney, Peter Zhou, Jeff Neemann, Bruce Long</i>	

SESSION 5A – OPERATOR FORUM

Ozone Decay Study to Optimize the Ozone System Operation at the A. H. Weeks Plant, Windsor, Ontario	144
<i>Saad Jasim, Juliann Sladic, Diane Guerrieri, Kerwin Rakness, Nihar Biswas</i>	
The Central Lake County Joint Action Water Agency Ozone Experience	157
<i>Bill Soucie, Brett Sheen, Robert Madura</i>	

SESSION 5B – OZONE COMPATIBLE MATERIALS

Durability Test Results of Construction and Process Materials Exposed to Liquid and Gas Phase Ozone	169
<i>William Sleeper, David Henry</i>	
Ozone and Oxygen Gas System Cleaning and Verification	183
<i>Daryl Roll, Tom Doyle</i>	

SESSION 6 – TASTE AND ODOR CONTROL AND OXIDATION

Effect of Diurnal pH and Temperature Shifts on Ozone Demand and Taste and Odor Control	187
<i>Jeff Neemann, Michelle Cheek, Jim Stockton, Robert Noelle</i>	
Ozonation to Achieve Multiple Objectives in Drinking Water Treatment	198
<i>Steve Booth, Guy Carpenter, I. H. (Mel) Suffet, Bryan Huey</i>	
Using Ozone Oxidation and BAC Filtration to Remove Color, Taste and Odors	212
<i>C. Thompson, John Bednarski, Diana Leach, William Johnson, Graham Juby</i>	
Recent Developments in Ozone and UV Technologies For Small Water Systems and Swimming Pools	221
<i>Rip Rice</i>	
Oxidation of N-Nitrosodimethylamine (NDMA) by Hydroxyl Radicals	237
<i>Sun Liang, Joon Min, James Green</i>	
Ozonation of Dichlorodiethyl Ether (DCDE)	250
<i>Tuba Turan-Ertas, Mirat Gurol</i>	

SESSION 7 – FOOD APPLICATIONS OF OZONE

Ozone as an Antimicrobial Agent for the Treatment, Storage and Processing of Foods in the Gas and Aqueous Phases - - Supporting Data for a Food Additive Petition	259
<i>Rip Rice, Dee Graham, Charles D. Sopher</i>	
Impact of Ozonated Water on the Quality and Shelf-Life of Fresh Citrus, Stone Fruit and Table Grapes	281
<i>J. Smilanick, D. Margosan, F. Mikota</i>	
Ozonation of Fruit Process Wash Water: A Characterization Study	298
<i>Brian Hampson, Maria Pedreno-Navarro</i>	
The Mortality of Stored-Product Insects Following Exposure to Gaseous Ozone at High Concentrations	309
<i>James Leesch</i>	
Ozone Improves Processing of Fresh-Cut Produce	317
<i>Jurgen Strasser, Dee Graham, John Mount, Walter Strickland, George Battles</i>	
Ozone Oxidation of Poultry Reuse Water	322
<i>William McGrane, J. Phillips, R. Sverluga</i>	

SESSION 8A – DESIGN & OPERATION FOR PLANT OPTIMIZATION

A Case Study of Renovating an Aging, Conventional Water Treatment Plant to Meet Future Regulations and Improve Customer Satisfaction	328
<i>Peter Zhou, Peter Martin, Dale Newkirk, Pat Panus</i>	
A Unique Opportunity to Reduce Ozone System Operating Costs by Using Oxygen-Rich Ozone Contactor Off-Gas to Improve Source Water Quality	340
<i>J-F Debroux, C. Thompson, S. Fiori, G. Haggin, D. Kendall, A. Horne</i>	
Evaluation of Existing Sedimentation Basins as Contactors to Reduce Costs of Ozonation Upgrade	348
<i>Robert Jarnis, Uday Kelkar, Lee Anne Jones, Katrina Blom</i>	
The Effect of Dissolved Gases on Biologically Active Filtration: Bench-Top and Pilot Scale Studies	365
<i>David E. Kimbrough, Paul Rowley, Stephen McLean</i>	

SESSION 8B – WATER CONDITIONING AND WASTEWATER APPLICATIONS

Shell Fish Control by High Concentration Intermittent Ozone Injection	378
<i>Taka Ogawa, Paul Rutherford, Takashi Ando, Shingo Mine</i>	
A Simple Ozone System for Cooling Towers	384
<i>W. Craig Meyer, Barbara Harmon</i>	
Case Study of Sterile Purified Water Disinfection with Ozone in Pharmaceutical Applications	393
<i>Chiou-Hwa Su</i>	
A Short and Partial Pool Chemistry Primer – Where Can Ozonation Improve Pool Water Quality?	398
<i>Wolfram Hartwig</i>	

SESSION 9A – AGRICULTURAL APPLICATIONS OF OZONE

General Agricultural and Some Other Applications of Ozone, 10 Years Experience.....	402
<i>Ariel Villarreal, Arnulfo Perez</i>	
Ozone as a Gaseous Soil Treatment Agent as an Alternative to Methyl Bromide for Pre-Plant Fumigation	407
<i>Alan Pryor</i>	
Modifications of Soil Physical and Chemical Properties as the Result of Ozone Fumigation	428
<i>Matthew Stong, C. Amrhein, J. Alder, L. Chang, F. Ahkter, M. A. Anderson, M. Matsumoto</i>	

SESSION 9B – OZONE MASS TRANSFER STUDIES

Comparison of the Simulation and Experimental Data of the Ozone Mass Transfer in a Semi-Batch Reactor	445
<i>Tatyana Poznyak, J. L. Vivero, J. A. García</i>	
Modeling Ozone Mass Transfer in Reclaimed Wastewater	457
<i>Hsiao-Ting Chen, Roger Babcock, Michael Stenstrom</i>	
Maximizing the Enhanced Ozone Oxidation of Kraft Pulp Mill Effluents in an Impinging-Jet Bubble Column	482
<i>Mohamed G. El-Din, Daniel Smith</i>	

SUPPLEMENTARY MATERIAL

DIRECT FOOD ADDITIVE PETITION - Ozone as an Antimicrobial Agent for the Treatment, Storage and Processing of Foods in Gas and Aqueous Phases
Dee M. Graham

Author Index