



Beth Hamil

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Introduction

During my 31-year tenure at DEL Industries (DBA DEL OZONE, a full-scale ozone system manufacturer) my responsibilities included corporate operations, regulatory compliance, design, development and utilization of ozone sanitation systems for multiple applications. This required me to be a student, teacher, researcher, collaborator, designer and published author of ozone technology and its associated microbial efficacy and human/environmental safety, (including regulatory compliance and sustainable practices), in all aspects of successful ozone integration. I am uniquely qualified to offer this extensive knowledge to those who are seeking a better understanding of ozone sanitation practices and sustainable sanitation solutions.

Experience

Professional experience in ozone system development, ozone applications, ozone consulting (including applications engineering), and project management, spanning a comprehensive range of commercial and residential industries. These include, but are not limited to, aquatics, food safety applications (commercial and food service), wineries, pharmaceutical and industrial uses.

Highly experienced and very adept with regulatory compliance responsibilities for the use of ozone, while staying up-to-date with emerging governmental compliance developments. Maintaining an ongoing focus for developing parameters for ozone efficacy and worker/environmental safety for a broad range of applications.

Authored regulatory code for numerous ozone applications, interfaced with government agencies to assist in their understanding of ozone's efficacy and safety, and a working member of multiple public health standards writing committees as their chosen ozone expert. Developed protocols for efficacy testing of ozone in several applications, including those for surface sanitation with aqueous ozone as well as water and product sanitation with species-specific pathogens, with accredited third-party testing agencies as well as Universities across the United States.

Specialty Services Offered

Ozone Science Education/Presentations
Ozone System Sizing
Ozone System Applications
Ozone Study Protocol Development
Project Management and Teamwork

Sanitation Consultation
Technical Writing
Trouble-Shooting
Ozone Integration
Ozone Consultation

Collaborated Research Studies

California State University Fresno: Surface Sanitation
University of California Davis: Surface Sanitation
California Polytechnic State University: Surface Sanitation
University of Wisconsin: RTE Inoculated *Listeria monocytogenes*

Penn State University: Meat Inoculated *E. coli*
University of Illinois: Surface Sanitation
Johns Hopkins University: Surface Sanitation
Louisiana State University: Surface Sanitation & Fish
The Ohio State University: Ozone and CIP (MAFMA)
Grant co-funded by USDA)

Third-Party Accredited Studies (Including Protocol Development) and Other Studies Performed

- NSF/ANSI Standard 50 ozone efficacy compared to chemical sanitation
- The Toxicology Group, LLC A Division of NSF International disinfection efficacy of aqueous ozone per AOAC Methods 961.02 and 960.09 and The Hazard Communication Standard (HCS) as promulgated through Occupational Safety and Health Act of 1970 and documented in the Code of Federal Regulations, Title 29, Chapter XVII, Part 1910, Section 1910.1200
- NSF/ANSI Protocol P308 Ozone Sanitation Systems for Jetted Bathtubs and Pedicure Footbaths
- NSF/ANSI J-00047649; testing and validating the efficacy of low-dose ozone for a 3 log (99.9%) reduction of *Cryptosporidium parvum* in commercial aquatics
- NSF study evaluating the efficacy of ozone in killing various bacterial species in consortium and individually as a validation of ozone as a component in CIP
- Various Private and Academia studies on species-specific microorganisms on multiple substrates for desired log reduction

Regulatory Technical Committee Participation

- Model Aquatic Health Code/Centers for Disease and Prevention (MAHC)
- ANSI/APSP Water Quality Technical Committee
- NSF/ANSI Joint Committee Standard 50 (Recreational Aquatics)
- NSF/ANSI liaison for ozone compliance to NSF White Book and other NSF listings
- IAPMO Water Quality Technical Committee
- Personal assistance in the FDA Model Food Code
- Participation in multiple regulatory compliance reviews for the use of ozone in various applications

Technical Presentations

- Ozone Antimicrobial Applications for the Meat Industry (Eastern Meat Packers Association)
- Ozone Technology Review and Applications in Fresh Produce Processing; Balancing Efficacy & Safety (IFT Annual Meeting & Food Expo)
- Ozone Secondary Disinfection for Public Swimming Venues Under MAHC Compliance (International Ozone Association Annual Technical Conference)
- Ozone Secondary Disinfection for Public Swimming Venues Under MAHC Compliance (National Environmental Health Association Annual Conference)
- Ozone Secondary Disinfection for Public Swimming Venues Under MAHC Compliance (World Aquatic Health Conference)
- Ozone & Germicidal UV Advanced Oxidation Process (AOP) A Synergistic Sanitation Approach for Residential Pools (International Pool Spa Educational Track)
- Ozone and Salt Chlorine Generator Sanitation Synergy (International Pool Spa Educational Track)
- Ozone Use in Wineries; Non-Thermal Sanitation (International Wine Show)
- Ozone Sanitation for Direct Food Contact, Surface Sanitation and CIP in Food Processing (Northwest Food Safety & Sanitation Workshop)
- Integration of Aqueous Ozone in RTE Meat Processing – A Case Study (Ozone IV Conference Fresno State)

- The Use of Ozone in General in Food Processing (USEPA Antimicrobials Office Meeting)
- Ozone Sanitation for Direct Food Contact, Surface Sanitation and CIP in Food Processing (Multiple Venues)
- Featured speaker on ozone technology and applications at over 200 technical seminars throughout the US and abroad since 1985

Technical White Papers

- Understanding Ozone Manufactured from Oxygen vs. Dried Air
- Optimizing Mass-Transfer of Ozone Gas into Aqueous Solutions
- Ozone Secondary Disinfection for Public Swimming Venues Under MAHC Compliance
- Ozone + Germicidal UV System - Advanced Oxidation Process (AOP) for Residential Pools

Publications

Journal of Water and Health 11.2 2013

Laboratory validation of an ozone device for recreational water treatment

Robert S. Donofrio, Sal Aridi, Ratul Saha, Robin Bechanko, Kevin Schaefer, Lorelle L. Bestervelt and Beth Hamil

Application Guidelines for the use of Ozone for Commercial Pools and Spas (Co-author); used as the basis for the State Health Department Guidelines including NY, OR, WA, CA, FL

Consultant History (31 years)

- Individual State Guidelines for the use of ozone in Commercial Aquatics
- USEPA/FDA/USDA and End-Users regarding the use of aqueous ozone for Surface Sanitation, Direct Food Contact and CIP in Food Processing and Food Service
- Multi-industry applications of ozone-based sanitation systems for all aspects of sanitation for antimicrobial improvement, energy savings, water savings, labor savings and improved sustainable practices
- Developed ozone sizing and dose protocols (CT Values) for commercial aquatics, surface sanitation, CIP, direct food contact, bottled water, well-water and various proprietary industrial applications

Industry Affiliations

International Ozone Association (IOA)

International UV Association (IUVA)

Institute of Food Technologists (IFT)

International Society of Beverage Technologists (ISBT)

International Association of Food Protection (IAFP)

Water Quality Association (WQA)

Association Aquatic Life Support Operators (AALSO)

Association of Pool and Spa Professionals (APSP)

California Environmental Health Association (CEHA)

National Environmental Health Association (NEHA)

American Water Works Association (AWWA)

World Water Park Association, (WWA)

International Society of Pharmaceutical Engineers (ISPE)

International Association of Plumbing and Mechanical

Officials (IAPMO)

Council Model Aquatic Health Code (CMAHC under CDC)

Patents

US Patent Number 5,834,031

Apparatus and Methods for Treating Foot Fungi 11/10/98

Professional Certifications

HACCP Certified

Certified Pool Operator