

Ozone: an advancing technology

By Paul Overbeck

Use of ozone expands across industries in 2007

The year 2007 began with a prediction of increasing global interest in—and demand for—ozone amongst established and emerging markets. This interest was driven by concerns for protection of public health. The year-end results show that ozone—one element of a group of processes recently referred to as an “advanced technology” by some and a “green technology” by others—is receiving strong acceptance in many industries. The following summarizes the International Ozone Association’s (IOA) educational activities and process applications in two markets.

Watch for more details in future installments of WQP’s Ozone Corner.

The Agri-Food Market

This emerging market for ozone had IOA and its members involved with several educational events during 2007. IOA conducted a day-long workshop on commercial-industrial applications as part of the Water Quality Association’s (WQA) annual conference. Many attendees commented that the material presented on food processing held great potential for them locally.

A few weeks later, ozone technology in the agri-food industry was headlined at the International Water Technology Conference held by the International

Center for Water Technology at California State University in Fresno, Calif., the heart of central California’s agricultural region. Two days of technical papers were given on ozone use in soil treatment, product fumigation, wash practices and surface sanitation.

The World Congress on Ozone and Ultraviolet Technologies, held in August, proved ozone is not only a hot technology in North America. Eight-hundred and thirty delegates from 32 nations appreciated the diverse technical program, which featured two days of presentations and more than 250 technical papers related

to ozone in the agri-food industry.

And most recently (October), both private and governmental sector attendance was strong at the IOA EA3G-organized International Conference on Sustainable Agri-Food Industry: Use of Ozone & Related Oxidants, hosted by AINIA in Valencia, Spain.

Ozone use in the food processing industry has grown rapidly since ozone was approved as an antimicrobial agent by the U.S. Food and Drug Administration in June 2001. Members reported a significant jump in inquiries and orders following the 2006 *E. coli* outbreak in fresh-cut, bagged and ready-to-eat spinach.

Before the outbreak of *E. coli* O157:H7 was over, five people were dead and more than 205 others in 26 states had endured a sickness that may have left them vulnerable to future health problems. This incident shook America’s agricultural industry and exposed the vulnerability of America’s system for delivering fresh produce to markets.

The outbreak would ultimately cost the leafy green industry more than \$350 million as the U.S. public turned away from its growing appetite for fresh, ready-to-eat spinach. Sales of packaged spinach are still down by as much as 20% from pre-outbreak levels, industry executives said.

Ozone has proven to be effective at inactivating food-borne pathogens in testing by NSF. Pathogen reduction performance by a DEL Ozone (an IOA member) ozone spray wash system is presented in Table 1.

Health Care: Commercial Laundries

National and local news media have been working overtime since the Centers for Disease Control and Prevention (CDC) reported in the October 2007 *Journal of the American Medical Association* that in 2005, 94,000 people contracted serious or invasive staph infections, and 19,000 of them died—rates three times the previous estimates.

Both staph and a drug-resistant, harder-to-treat strain known as methicillin-resistant *Staphylococcus aureus* (MRSA) can cause serious skin infections, pneumonia or infections of the bloodstream, ear, urinary tract or the lining of the brain. MRSA had nearly always been connected to health care facilities,

TABLE 1: Antimicrobial Efficacy* Results

Challenge Microorganism	Applied O ₃ Dose	O ₃ Dose at Nozzle	Exposure Time	Log/Percent Reduction
Salmonella choleraesuis (ATCC 10708)	3.0 ppm	1.85 - 2.25 ppm	3 minutes	6 log/99.9999%
Staphylococcus aureus (ATCC 6538)	3.0 ppm	1.85 - 2.25 ppm	10 minutes	6 log/99.9999%
Pseudomonas aeruginosa (ATCC 15442)	3.0 ppm	1.85 - 2.25 ppm	5 minutes	6 log/99.9999%
Trichophyton mentagrophytes (ATCC 9533)	3.0 ppm	1.85 - 2.25 ppm	30 seconds	6 log/99.9999%
Listeria monocytogenes (ATCC 7644)	3.0 ppm	1.85 - 2.25 ppm	3 minutes	4 log/99.99%
Campylobacter jejuni (ATCC 33250)	3.0 ppm	1.85 - 2.25 ppm	3 minutes	4 log/99.99%
Aspergillus flavus (ATCC 9296)	3.0 ppm	1.85 - 2.25 ppm	5 minutes	4 log/99.99%
Brettanomyces bruxellensis (ATCC 10560)	3.0 ppm	1.85 - 2.25 ppm	3 minutes	4 log/99.99%
Escherichia coli* (ATCC 11229)	3.0 ppm	2.1 ppm	30 seconds	5 log/99.999%

* AOAC Official Method 961.02, Germicidal Spray Products as Disinfectants. AOAC Official Method 960.09, Germicidal and Detergent Sanitizing Action of Disinfectants.



hospitals and nursing homes, but now about 15% of MRSA cases in the U.S. are spreading into public facilities, such as schools, athletic facilities, health clubs and hospitality industries, according to the CDC report.

CDC recommendations for preventing infections in the general public focus on good hygiene, including regular and rigorous hand washing, showering and not sharing towels, razors and other potentially contaminated items or surfaces with others. It also recommends keeping a barrier, such as clothing or a towel, between your skin and shared equipment and doing an antimicrobial wipe down of frequently contacted surfaces, such as faucets, tubs, sinks, floors, toilets and shower stall surfaces before and after use.

IOA members, including Clearwater Tech, DEL Ozone and Pacific Ozone, have been out front on laundry applications with laboratory and real-world application studies, in conjunction with

their customers and testing agencies, to show that ambient temperature wash of laundry and surfaces with ozonated water is effective at reducing pathogenic organisms, including *Staphylococcus aureus* bacteria and MRSA by up to 99.9999%.

In a paper presented at the IOA conference in Arlington, Texas, titled, "Ozone in the Laundry Industry—Practical Experiences in the United Kingdom," Cardis, et. al. reported on comparative testing conducted by Microsearch Laboratories that confirmed low-temperature ozone wash is extremely effective at deactivating organisms typically found on garments, towels and linens from healthcare facilities, including the "super bug" MRSA and the dangerous and hard-to-kill *Clostridium difficile*.

Providing Protection

Ozone currently protects public health in drinking water and wastewater treatment and is proving to be a safe and



Photos courtesy of Clearwater Tech.

effective antimicrobial, sanitizer and disinfectant in numerous commercial and industrial applications. IOA will continue to offer educational opportunities to those interested in ozone technology, including a workshop at the WQA Aquatech 2008 show and an IOA conference in Orlando this coming August. *wqp*

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