

# Ozone gains ground in food processing

By Charles D. Sopher, Ph.D.

Because chlorine provides residual antimicrobial effects and has been available in Europe and the US since the end of World War I, it became the major antimicrobial for much of the world.

However, ozone does have an advantage over chlorine because it is effective against *Cryptosporidium* and *Giardia*. Further, ozone works well when used as a primary treatment, with chlorine additions providing residual antimicrobial protection.

In the late 1980s an expert panel of ozone and food scientists reviewed all known literature on the use of ozone as an antimicrobial agent in food processing. From this review, the expert panel declared ozone as GRAS (Generally Recognized as Safe) in 1997.

The GRAS affirmation was not disputed by the US Food and Drug Administration (FDA), and several companies used ozone as an antimicrobial agent in food processes. Scientists then developed a Food Additive Petition, which was accepted by the FDA and published in the *Federal Register* on July 26, 2001. In December 2001, the US Department of Agriculture (USDA) also accepted the petition.

The petition is broad in scope and basically allows the use of both gaseous and aqueous ozone as a contact antimicrobial agent on food products.

## Microbes that mutate

Microbes that contaminate food products continually mutate. As a result, the safety of US food supplies due to microbial contamination changes over time. These changes require an ever-increasing arsenal of antimicrobial agents to ensure safe food products.

This need for additional antimicrobial protection coupled with the GRAS affirmation and the Food Additive Petition have spawned a great amount of interest in the use of ozone in the agri-food industry. The following are examples of these activities:

- The Electric Power Research Institute (EPRI), through Global Energy Partners, LLC, Lafayette, CA, has conducted and published 17 research reports of studies using ozone as an antimicrobial agent in agricultural production and food processing.
- The International Ozone Association has formed an Agri-Food Committee to track and provide a meeting forum for presentation of agri-food ozone studies.
- Several ozone companies are conducting research and developing hardware (machinery) for the use of ozone in the

agri-food industry.

### **Adoption has been slow**

Although many studies have been conducted and several ozone systems have been installed, the adoption process in the agri-food industry is slow. Until recently bench-scale equipment had to be developed or expensive installations made based on theory and experience.

This approach is now changing and smaller portable units are available for testing ozone treatments in actual production settings.

Small ozone generators can be connected to air dryers, oxygen generators or bottled oxygen, and controlled levels of gaseous ozone can be applied at specific sites in a manufacturing process.

Although the process is slightly more complicated, the same generators can be used with the proper aeration equipment and a pressurized water tank to provide aqueous ozone for site-specific applications. For example, one manufacturer has configured units for testing the treatment of catfish fillets, cut vegetables and blueberries.

### **Site-specific measurement**

When using site-specific machines, it is important that equipment for measuring ozone concentrations in treatment solutions — as well as for measuring off-gas levels — is available.

Much misinformation has been propagated by the thinking that bubbling ozonated air through water will generate aqueous ozone.

This may be possible, but an ozone titration of the aqueous solution is the only method to be sure of the ozone content in the solution and to avoid erroneous conclusions.

The use of ozone in the agri-food industry has grown enormously (see sidebar) since FDA acceptance of the use of ozone in contact with food products. All of the various agri-food industries have the potential for a vast number of uses of ozone, from raw product sanitation to finished product storage. The field will grow tremendously in the next few years.

---

*Charles D. Sopher, Ph.D. is a consultant based in Washington, NC, who conducts agri-food research and is manager of the Global Energy Partners, LLC-Agri-Food Technology program. This article was provided by ClearWater Tech, LLC, San Luis Obispo, CA, a manufacturer of ozone generators and related equipment for residential, commercial and industrial applications.*