

Suppressive Antimicrobial Treatment: Ozone/Water Spray for California Fresh Produce Processor

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Abstract

Aqueous sprays of Ozone treated water, 1.25 to 2.40 ppm were applied to various produce conveying surfaces for varying times. This treatment followed the fresh water rinse which is a routine first step in the daily plant clean up protocol. Aerobic Plate Counts of various sites sampled after the fresh water rinse but before the ozone/water treatments ranged between 5.7×10^4 cfu and 3.0×10^3 cfu. After the various treatments with ozone/water mixture Aerobic Plate Counts ranged between 1.0×10^2 and $<1.0 \times 10^1$ cfu. This paper discusses the methodology of ozone/water applications and practical uses for this ozone/water application.

Background

Requirements for food safety and sanitation procedures within the “fresh cut” and processed food industries obligate those parties responsible for food production facilities to routinely and frequently monitor the density of microbial contamination existing at certain critical points within the production process. This monitoring requirement extends to finished product, but also applies to the steps of the processing sequence which are designated as “critical control points”.

Microbial suppression procedures in place at each critical control point are usually incorporated into the HACCP food safety plan for each food processing facility. As such, these microbial suppression procedures are validated as to their effectiveness.

Food processing facility managers are aware that occasional lots of raw materials, i.e. field fresh produce may carry higher than normal amounts of dirt or other soilage. In these cases, plant managers require the ability to take additional microbial suppressive measures either involving the produce directly or involving elimination of contamination on conveying and produce handling equipment.

The following paper demonstrates the efficacy of ozone/water treatments for this need.

Materials and Methods

Treatment site: The site for this work was a food processing facility in Central California. The produce handled at this facility is fresh, peeled garlic cloves and pieces. The location within the plant involved produce conveying belts which represented each of the key locations within the produce handling line.

Ozone/Water Contact Unit: The equipment used for this work was the ClearWater Tech, LLC. HDO3 Skid. This unit is in routine service at the test facility, although its function is to provide ozone bearing water at specific sites within the produce handling line. The HDO3 Skid conveys 7 gpm water at approximately 20 psi. The water conveyed by the skid was mixed with various levels of ozone, generated by Corona Discharge technology, and calibrated against Colormetric ozone testing tubes. Ozone concentration was monitored continuously using the Fischer Rosemont ozone monitor provided as a standard component of the CWT HDO3 Skid.

Microbial Sampling: Sampling was performed with sterilized swabs which were provided in protective tubes by Microbac Laboratories, Corona, CA. Each swab was carefully applied to a standardized circular template of a nominal 1 inch diameter. Laboratory analysis was performed by Microbac Laboratories, method CLTMS 03.01.

Testing Dates: The treatments as described and the sampling as described were performed on two successive dates approximately one month apart. The samples were submitted to the laboratory within 24 hours, April 1 and May 2, 2003.

Application method: The ozone concentration in water passing through the ozone/water contact unit was determined with the electronic ozone monitor and checked against the Colorimetric tubes. The ozone/water was then applied in a continuous stream to the specific parallel surface for times (seconds) as listed in Table I.

Results

Table I: Results of Ozone/Water Rinses

Location	Rinse Time (seconds)	Ozone Concentration	
		1.25 ppm	2.4 ppm
Product Dump: April 1			
	Zero (control)	>5.7 x 10(10)	>5.7 x 10(10)
	15 seconds	1.0 x 10(2)	
	30 seconds	<1.0 x 10(1)	<1.0 x 10(1)
	45 seconds	1.0 x 10(2)	
Cross Belt: April 1			
	Zero (control)	>5.7 x 10(4)	
	15 seconds	5.0 x 10(3)	
	30 seconds	4.0 x 10(3)	
	45 seconds	<1.0 x 10(1)	
Product Dump: May 2			
	Zero (control)	>5.7 x 10(4)	
	15 seconds	1.5 x 10(1)	
	15 seconds	1.5 x 10(1)	
	15 seconds	1.5 x 10(2)	

Discussion:

The data indicates satisfactory “log” reductions in microbial concentration at each time/concentration tested. The Cross Belt results of April 1 indicate a possible bias toward greater suppression as correlated with longer duration of spray, but the Product Dump results of May 1 indicate no such relationship. Perhaps the surface characteristics of each type of material used within the production facility has as much influence over the microbial suppression as the time/concentration of ozone in water. This may become the objective of further investigation.

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