

Ozone Treatment of Fruit and Vegetable Wash Water

Introduction

Consumers and regulators are concerned about the safety of ready to eat (RTE) foods such as fruits, vegetables and salad products. This includes preventing contamination from both pathogens and chemical contaminants. In the US chlorine is often used to disinfect the wash water for salads.

The use of chlorine can lead to contamination of the salad with chlorinated chemicals. In fact the European Union has significantly restricted the use of chlorine for salad washing for this reason. Many European packagers have switched their disinfectant to ozone.

Ozone is a more powerful disinfectant than chlorine, chlorine dioxide or peracetic acid. It is effective against a wide range of pathogens including bacteria, viruses, cryptosporidium, giardia, etc. More importantly, ozone has a lifetime of only 10-20 minutes in the water after which time it breaks down to oxygen. Therefore it does not leave behind harmful by products as do chlorine or chlorine dioxide. This prevents contamination of the salad with disinfection byproducts and also allows for easy discharge of the used wash water.

Application

Ozonated water is used in a variety of operations to wash fruits and vegetables including RTE salad products.^{1,2,3,4} Ozone is often used in conjunction with filtration to enhance the effectiveness of ozone. Typically, a side stream from the flume is injected with ozone and then introduced back into the flume in order to maintain a relatively constant concentration of ozone. In some cases, if a residual concentration of disinfectant is required, chlorine can be added. The amount of chlorine required under these circumstances will be substantially lower than that used with chlorine as the principal disinfectant.

The ozonated side stream will be highly concentrated in ozone, so some type of diffuser will be necessary to insure good mixing of the side stream with the bulk flume water. In some cases water from the flume is continuously recirculated through the ozone unit drawing in and absorbing the ozone gas before being returned to the wash tank.

The ozone system should be designed to maximize the transfer efficiency of the ozone into the water. The system should also provide for degassing of the water and decomposing any excess ozone before it enters the work area or the general environment.

Ozone concentrations of 0.05 to 0.15 ppm have been used in flume washing applications while concentrations of 1 to 3 ppm have been used in spray washing applications.

Control techniques are similar to chlorine, for example using redox measurement to control the dosage of ozone applied. Ozone concentration should be controlled in order to maintain precise levels of ozone in the wash water at all times.

Benefits of Ozone Treatment of Salad Wash Water

Improved Taste and Appearance - Ozone has been shown to improve taste and appearance of fresh cut salad for the RTE market while controlling food borne pathogens.

Greater Shelf Life – Reduced counts of bacteria which lead to food spoilage increases shelf life and shipping distances.

Lower Water Requirements and Support Water Recycling – When combined with filtration, ozonation can increase the amount of time water can be used before it must be discharged versus similar operations using chlorine. This is because besides being an outstanding disinfectant, ozone can oxidize organic contaminants in the flume water. In addition, ozone has a micro flocculent activity which enhances filtration.

Eliminate THM and other Chlorinated By Products – Unlike chlorine, ozone does not create chlorinated by products. European regulations control the residual of these by product on food. In addition, some NPDES permits limit discharge of chlorinated by products.

Reduce Pesticide and other Chemical Residuals on Food – The chemical oxidizing action of ozone can breakdown toxic chemicals such as pesticides on food making them biodegradable.

Spartan Ozone Generators

Spartan supplies the OZOLINE and STERILINE ozone generator systems for food and beverage processing applications including salad washing operations.

Footnotes:

1. Ozone Applications in Apple Process, EPRI, Palo Alto, CA:1998. TA-112064
2. Direct Food Additive Petition: Ozone as an Antimicrobial for the Treatment, Storage and Processing of Foods in Gas and Aqueous Phase, EPRI, Palo Alto, CA: August 2, 2000, Section 2.4.7.
3. Use of Ozone in Water on Fruit, EPRI, Southern California Edison. Rancho Cucamonga, CA: 2002.1007108
4. Ozone Improves processing of Fresh-Cut Produce, EPRI, Palo Alto, CA: 2002. 1007466