



### FEATURES OF OZONE

- ELIMINATES ETHYLENE
- CONTROLS MOLD GROWTH
- EXTENDS PRODUCT STORAGE TIME
- WORKS IN RA AND CA ROOMS
- INCREASES PRODUCT QUALITY
- MINIMIZES CHEMICAL USAGE
- MAINTAINS ORGANIC STATUS

### PRODUCTS STORED

APPLES	LEMONS	KIWI	GRAPES
ONIONS	POTATOES	MANGOS	NUTS
LIMES	PEACHES	CHERRIES	FISH

### DESCRIPTION

Ozone an excellent application for CA and RA cold storage rooms because it controls ripening, reduces the use of chemicals and addresses food safety concerns. Ozone applied to cold storage rooms destroys ethylene by converting it to CO<sub>2</sub> and water, molecule by molecule. In an environment of low level ozone, airborne mold spores will not grow, eliminating nesting molds and cross contamination spoilage. The pur<sup>o</sup>tecs system for fresh produce continuously applies ozone at a level safe enough for employees to enter and work in the cold storage rooms. This application has been utilized for over 10 years for a wide variety of products all showing reduced spoilage and increased pack-outs over long term storage. Ozone is compatible with traditional post harvest chemicals.

### OPERATION

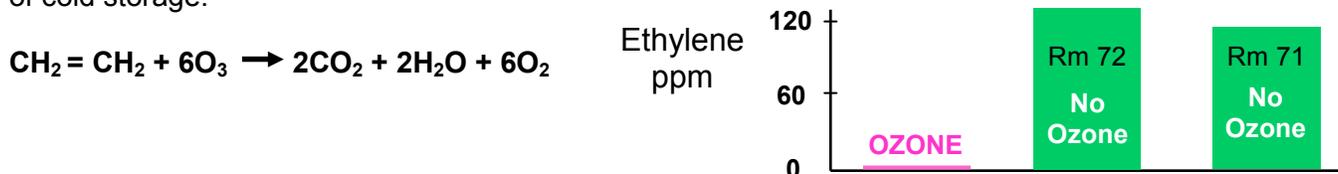
The pur<sup>o</sup>tecs ozone generator is located outside and near cold storage rooms. One generator can treat up to four individual cold storage rooms, each with its own control setpoint. Ozone is produced by the ozone generator and distributed to the Room Monitor/Controllers for application to each room. The ozone gas is applied continuously at 80 ppb to 300 ppb (.080 to .30 ppm). Personnel are free to enter and work in rooms with an ozone level at or below 100 ppb for up to 8 continuous hours. The PLC with a color touch screen located on the ozone generator provides the operator with continuous monitoring of the entire system. Each Room Monitor/Controller includes a display for the ozone level in ppb and the setpoint in ppb. A front panel switch allows each room to be individually turned on or off. Ozone applied by the INVENX process ensures the ethylene will be eliminated and mold spores that have sporulated will not grow. Mold growth on damaged product will not spread to adjacent product. The use of fungicides and other chemicals are not required and, if applicable, the stored products will maintain their organic status. This cost effective process will significantly reduce the spoilage over long term storage and provide increased pack-outs and profits.

Ozone can also be used to clean rooms prior to them being filled. The room is closed and the ozone is applied at between 2 to 5 ppm for up to 48 hours. This will disinfect the entire room and whatever is in the room. Personnel cannot enter the room during this treatment. After turning the ozone generator off the ozone will naturally decay within a few hours leaving the room clean and safe to enter.



## ETHYLENE CONTROL

Ethylene is produced by fresh fruits and vegetables and causes them to continue to ripen. Applying ozone continuously to the cold storage facility maintains ethylene below the detection level of 2 ppb. The ozone is distributed uniformly throughout the room so any ethylene molecule produced by the product is converted to CO<sub>2</sub>, water and oxygen. Ethylene and ozone cannot exist together because ozone breaks the double bond of the ethylene molecule. This characteristic makes ozone an excellent organic choice to retard ripening without the use of chemicals that permanently destroy the products ability to ripen when brought out of cold storage.



**Ethylene:** Causes ripening of products and will damage others.

Commodity	C <sub>2</sub> H <sub>4</sub> Production	Sensitivity	Commodity	C <sub>2</sub> H <sub>4</sub> Production	Sensitivity
Apples	VH	H	Honeydew	M	H
Apricots	H	H	Kiwifruit	L	H
Asparagus	VL	M	Lemons	VL	M
Avocados	H	H	Lettuce, iceberg	VL	H
Bananas	M	H	Limes	VL	M
Beans, snap/green	L	M	Mangos	M	H
Broccoli	VL	H	Mushrooms	VL	M
Brussels Sprouts	VL	H	Nectarines	H	H
Cabbage	VL	H	Oranges	VL	M
Cantaloupe	H	M	Papayas	H	H
Cauliflower	VL	H	Peaches	H	H
Cucumbers	L	H	Pears	H	H
Endive	VL	M	Peas	VL	M
Figs	M	L	Plumbs/prunes	M	H
Grapefruit	VL	M	Spinach	VL	H
Greens, leafy	VL	H	Tomatoes	M	H

VL = Very Low      L = Low      M = Moderate      H = High

## MOLD CONTROL

Fresh harvested produce is covered with mold spores, and when placed in cold storage the molds continue to grow. All molds sporulate, releasing new spores that grow into new molds. Maintaining ozone at 50 to 150 ppb in the cold storage environment prevents the released spores from growing. Traditional treatment fungicides can reduce mold growth but they lose their effectiveness with time and the molds begin to grow into nesting molds. Individual products which have been damaged during harvest and packing will mold but ozone prevents the mold from spreading to adjacent products. For organic produce, ozone is one of the only solutions that provides long term control of all molds for cold stored products.



Stored 9 months in ozone



Stored 9 months no ozone



Ozone - Spoilage Contained