

## *MODERN APPROACH TO FOOD SAFETY ISSUES*



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*OZONE TECHNOLOGIES TO INCREASE THE SHELF LIFE OF FRESH  
VEGETABLES AND FRUITS*

# WHY OZONE?

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Almost half of the fruits and vegetables grown do not reach the end consumer due to inadequate storage conditions and imperfect food logistics. One of the most effective ways to solve this problem is to treat fresh fruit and vegetables with ozone ( $O_3$ ).

Ozone is a powerful and environmentally friendly disinfectant.

Ozone (CAS Reg. No. 10028-15-6) is recognized as a food additive. It can be safely used in food handling, storage, and processing (FDA, section 21CFR173.368).

According to FAO recommendations, ozone-treated berries and fruits can be eaten 18 hours after the last treatment.



# AIR-CONDITIONING OF VEGETABLE STORAGE AND COLD ROOMS

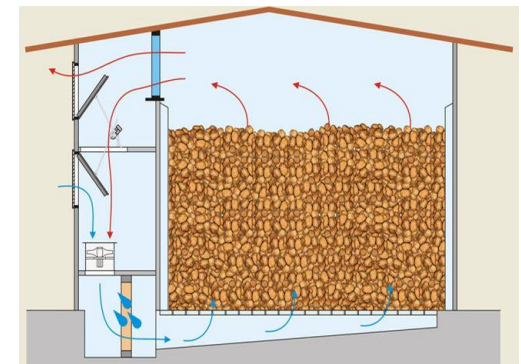
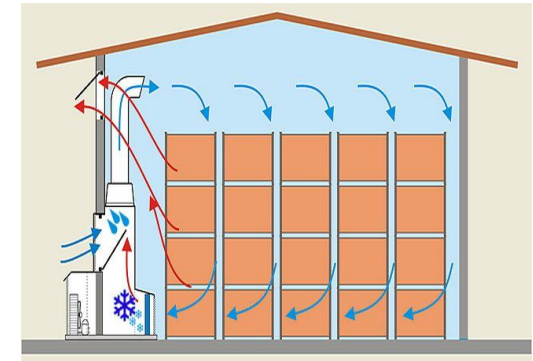


Ozone's ability to destroy various microorganisms, including putrefactive bacteria, mold, and fungal spores, makes it possible to effectively use it to extend the shelf life of food products in vegetable and grain storage facilities, cold stores, and refrigerated trucks.

Ozone destroys ethylene emitted by vegetables and fruits, thereby delaying their ripening and extending their shelf life.

Operating experience has shown that ozonation increases the shelf life of fresh fruit and vegetable products by 1.5...2 times while maintaining their organoleptic characteristics.

Ozonation reduces losses of stored products by 10...25% (without the use of preservatives).



# MECHANISM OF OZONE ACTION

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Due to its high oxidizing potential, ozone:

- ensures the destruction of various microorganisms, bacteria, viruses, molds and fungi destroys aromatic substances in the air;
- slows down the ripening of fresh vegetables and fruits;
- inhibits the vital activity of various parasites (ticks, bedbugs and other insects);
- adversely affects mice, rats and other rodents.

In a very short time, ozone turns into ordinary oxygen without having any harmful effects on ozonated products and the environment. environment.



# EFFECT OF OZONE ON SHELF LIFE

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Ozonation of fruit and vegetable products increases their shelf life by about 1.5-2 times and reduces losses of stored products by 10-25%.

When berries (strawberries, raspberries, cherries, grapes) are treated with low doses of ozone ( $3-8 \text{ mgO}_3/\text{m}^3$ ), their shelf life increases by 2 times.

After ozone treatment of apples with a dose of  $4-9 \text{ mgO}_3/\text{m}^3$ , their shelf life at room temperature increases to 15 days.

After treatment of apples with ozone at a dose of  $4-6 \text{ mgO}_3/\text{m}^3$ , their shelf life (without the use of inhibitors) at a temperature of  $+5^\circ\text{C}$  increases to 5 months.

Similar results were obtained during the storage of ozone-treated citrus fruits, bananas, tomatoes, potatoes, cabbage and other fruit and vegetable products.



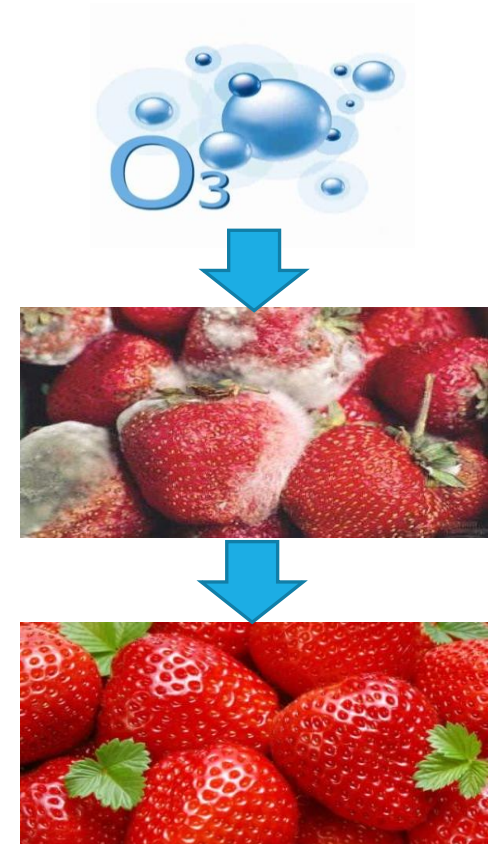
# TECHNOLOGY CAPABILITIES

The use of ozone for processing fruit and vegetable products, cold rooms and vegetable storages is simple, efficient and environmentally friendly.

The cost of processing fruit and vegetable products using ozone is several times lower than when using toxic inhibitors.

The ability of ozone to destroy putrefactive and pathogenic microflora makes it possible to effectively use ozone to increase the shelf life of perishable fruit and vegetable products during their transportation in refrigerated refrigerators.

Ozone is produced on-site using special devices called ozonators. The electricity consumption required for ozonation of fresh fruit and vegetables stored in a 1000 m<sup>3</sup> refrigerated chamber does not exceed 8 kWh per week.



# METHODS OF TECHNOLOGY REALIZATION

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To implement the proposed technology, ozonation units of the OZONIKA series developed by our company are used.

Ozonation units of the OZONIKA series provide:

- efficient processing of fruit and vegetable products, ensuring an increase in their shelf life;
- reduction of product losses associated with decay processes;
- destruction of microorganisms (bacteria, viruses, fungi, yeast, mold, mildew, fungi, yeast, mold, which are on the surface of products, containers, as well as inside the vegetable storage)sterilization of insects and neutralization of toxins released by them;
- repelling various rodents.



# OZONATOR INSTALLATIONS OZONIKA

<b>Parameter</b>	<b>Unit</b>	<b>Value</b>		
		<i>X-5</i>	<i>X-15</i>	<i>X-25</i>
<i>Productivity</i>	<i>mgO<sub>3</sub>/h</i>	<i>5000</i>	<i>10000</i>	<i>25000</i>
<i>Power</i>	<i>W</i>	<i>150</i>	<i>400</i>	<i>650</i>
<i>Voltage (50 Hz)</i>	<i>V</i>	<i>AC 230</i>	<i>AC 230</i>	<i>AC 230</i>
<b>Size:</b>				
<i>- width</i>	<i>mm</i>	<i>125</i>	<i>250</i>	<i>400</i>
<i>- depth</i>	<i>mm</i>	<i>650</i>	<i>650</i>	<i>750</i>
<i>- height</i>	<i>mm</i>	<i>150</i>	<i>275</i>	<i>350</i>

Ozonation units OZONIKA are equipped with an automatic ozone concentration control system, which ensures high efficiency of processing fresh berries, vegetables and fruits. Ozonation is carried out in accordance with the Methodological Recommendations on the use of ozone for disinfection of fruit and vegetable storages and potato storage (Ukrainian Research Institute of Trade and Public Catering, 1981).

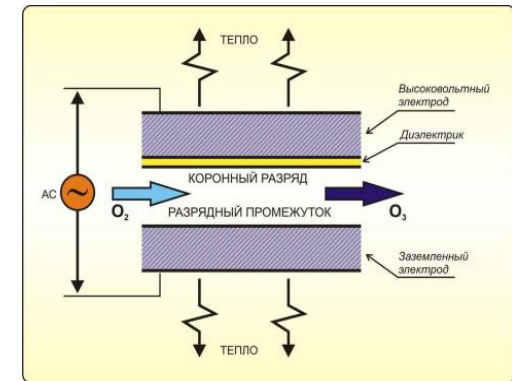
# DESIGN

Ozonator systems of the OZONIKA series provide ozone production from atmospheric air that has been pretreated. Ozone is formed as a result of a high-voltage electric discharge.

The OZONIKA consists of a discharge chamber (ozone generator), an air purification system, a fan, an ozone concentration control system in the treated volume (chamber, room) and an automatic control unit.

The automatic control unit ensures the maintenance of the required ozone concentration required for processing a specific type of product, which allows for the most favorable ozonation mode.

For ozonation of transported fruit and vegetables, a special modification of the OZONIK-5M units powered by the vehicle's onboard network has been developed, which allows transporting fruits and vegetables at higher temperatures.



# ADVANTAGES

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The use of ozonation systems developed by our company makes it possible to:

- store and transport ripe fruits, berries and vegetables;
- reduce losses from spoilage of transported products by 10-15%;
- reduce the amount of ethylene emitted by stored fruit and vegetable products and thus slow down their ripening rate;
- to avoid loss of commercial quality of perishable products that occurs as a result of their freezing or a sudden accident in the refrigerator;
- to abandon the use of toxic inhibitors for product processing.



## WHAT WE DO TODAY DETERMINES OUR FUTURE

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