Chapter 2
Optimization of Processing Modes of Disinfection of Vegetable Storehouses With the Use of Ozone

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ABSTRACT

The ozonation of fruits and vegetables may increase their storage life nearly twice as long. The chapter presents the results of research completed on the ozone treatment of vegetable storehouses with the use of ozone generators, with barrier and corona types of discharge, and reveals factors affecting disinfection process. The results show that ozone concentration depends on the dynamic balance of the two basic processes – the ozone-air mixture supply and ozone decomposition. Formulas for calculating ozone generator capacity in the recirculation mode have been derived. The automated system for controlling the disinfection process in a vegetable storehouse is described. The experimental test has shown that the ozone effect is long-term and the efficiency of the sterilization of surface microflora contaminants is 100%.

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INTRODUCTION

At storage of vegetables and fruits, the attention is focused on maintenance of storehouse microclimate parameters and electrically driven storage processes development. Capacity of a heating system is found based on storehouse thermal balance, at calculation of which the following aspects are taken into account: heat income from equipment; heat losses through walling; heat loss or heat input through grounds; heat losses with removed ventilating air; heat dissipation of potatoes at a 50% filled-in storehouse. In a storehouse for supporting of microclimate parameters, a system of active ventilation – including one with use of artificial freeze – must use the natural cold as much as possible. A refrigeration system is intended for removal of heat input from a storage object and other sources including that coming from products (of physiological and accumulated nature); containers; fences and walling; work of electric engines; illumination; ventilation with outside air; doors opening; workers; and so on. Choosing of a refrigeration system is determined by terms of products placement and distribution, technological modes of refrigeration, assumed temperatures of outside air, products heat and moisture production in a storage premise, etc. Depending on all those factors, a storehouse owner can adopt either a system with artificial refrigeration or a combined system with use of the natural cold. At present time for artificial refrigeration in storehouses, both centralized and decentralized systems of cold supply are used. Regardless of a specific engineering solution, it is evident that an artificial maintenance of microclimate parameters requires energy expenses.

For example, in the Fig. 1, the diagram is given of electric energy consumption of the storehouse of the agrarian firm Slava Kartofelyu, Ltd. intended for storage of 5000 tons of potatoes.

Analysis showed that for maintenance of microclimate parameters, for example, in winter period of time, the electric energy consumption reaches 5000 kWt·h/month including illumination. In this connection with purpose of electric energy saving in spring, potatoes producers should not use their existing electric equipment, which results in dramatic worsening of potatoes quality. That is why for maintenance of the microclimate parameters in a storehouse of potatoes, there are needed alternative energy & resources saving installations or systems of disinfection allowing conserving yield with proper quality as long as possible.

Figure 1. Electricity consumption graph