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USE OF ELECTROTECHNOLOGICAL INSTALLATION FOR BACTERICIDAL TREATMENT OF ELEVATOR SILOS

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Abstract. *This paper considers the prospective development of an electrotechnological installation for the bactericidal treatment of elevator silos using ozone. Modern equipment was studied and it was determined that an effective method is a system of electrodes with a row of rods with needles-plane, which ensures effective generation of ozone in the silo elevator.*

Keywords: *silo elevator, bacteria, microorganisms, bactericidal treatment, electrotechnological installation, ozone.*

In modern agriculture, it is important to ensure the storage of agricultural products in conditions that maximize their quality and duration of storage. One of the key challenges is to avoid the spread of bacteria and microorganisms in silo elevators, which can lead to spoilage of stored grain and other forage crops.

In this regard, the development of an electrotechnological installation for the bactericidal treatment of elevator silos becomes an urgent task for modern farmers and fodder producers. The use of bactericidal treatment technologies allows you to effectively protect grain and fodder stocks from the harmful effects of bacteria, fungi and other microorganisms, which can significantly improve the quality of products and ensure their safety for animals and people.

In this study, we will consider the process of development and implementation of an electrotechnological installation that will provide effective bactericidal treatment of elevator silos.

To conduct an analysis of modern equipment for the generation of an ozone-air mixture and to determine the main promising directions for the introduction of ozone into the construction of silos.

In modern conditions of storage of agricultural products in silo elevators, the problem of the spread of bacteria and microorganisms determines not only the quality of storage, but also the safety and cost of feed production (Fig. 1) [1].

Bacteria, fungi and other microorganisms can cause negative consequences, such as rotting, loss of nutritional value of products and even the formation of toxins, which threatens the health of animals and people. One of the key factors in solving this problem is the development and implementation of electrotechnological installations for the bactericidal treatment of elevator silos. These facilities use innovative methods, such as

electrical treatment, to destroy and inhibit the growth of harmful microorganisms, thereby ensuring long-term and safe storage of agricultural products.

Fig. 1 – An example of spoiled grain at the bottom of elevator silos and hoppers

This technology not only preserves the quality of products, but also affects the increase in production efficiency and the reduction of storage costs [2]. The development of electrotechnological solutions for the bactericidal treatment of elevator silos opens up new perspectives for a sustainable and safe agro-industrial complex, contributing to the improvement of the quality and competitiveness of agricultural products.

Ozone is highly oxidizing, simple, accessible, and can be obtained by electrosynthesis from air in the required place and quantity. But it is especially important that ozone is ecologically compatible, and it alone (except for oxygen) participates in the biological processes of the environment. It has many properties: bactericidal, fungicidal, virulicidal, deodorizing, insecticidal, demercurizing, stimulating, etc. [3].

The proposed design of the ozonator (Fig. 2) allows the installation to be integrated into the technological process without significant reconstructions and with minimal capital investments.

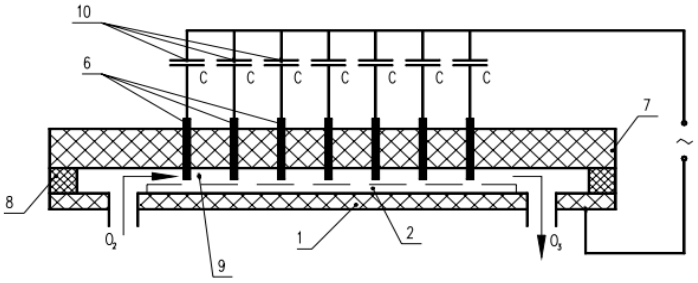

Fig. 2 – Barrier-free ozonator installation: 1 - metal electrode; 2 - zone of possible location of the dielectric barrier; 6 - sectioned electrode; 7 - plexiglass wall; 8 - liners; 9 - bit gap; 10 - ballast load

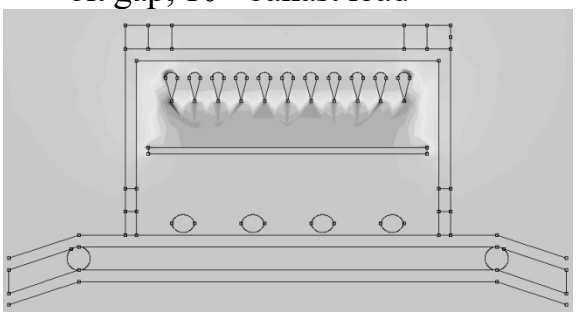

Fig. 3 – Distribution of electric field strength in the volume of the chamber ozonator

From the mathematical modeling of the electric field strength distribution (Fig. 3), it can be seen that it is more effective to use a system of electrodes with a row of rods with needles-a plane, since in this case a significantly greater value of the electric field strength is observed between the corroding and non-corroding electrodes.

This design has a certain advantage, since ozone is formed directly in the silo chamber, and since the electrodes of the ozone generator are located above the object of processing, the electric fields have a weak effect on the biology of grain products, in the case of its presence in the storage silo.

Analysis of modern equipment and mathematical modeling showed that the use of a system of electrodes with a row of rods with needles-a plane is a more effective method of generating ozone in a silo elevator. Implementation of the proposed ozonator unit allows to integrate the technology into the technological process with minimal capital investments and without significant reconstructions. Therefore, the development and implementation of an electrotechnological installation for the bactericidal treatment of elevator silos using ozone is a promising solution for improving the quality and safety of agricultural product storage. The implementation of this technology will contribute to the improvement of storage conditions and ensure the stability of the agro-industrial complex, maintaining the high quality and safety of products for animals and people.

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Анотація. *У даній роботі розглядається перспективна розробка електротехнологічної установки для бактерицидної обробки силосів елеватора з використанням озону. Досліджено сучасне обладнання та визначено, що ефективним методом є система електродів ряд стрижнів з голками-площина, яка забезпечує ефективну генерацію озону в силосному елеваторі.*

Ключові слова: *силосний елеватор, бактерії, мікроорганізми, бактерицидна обробка, електротехнологічна установка, озон.*

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