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INSTALATION FOR GRAIN DISINSECTION IN HIGH ELECTRIC FIELD

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Grain mass, granary pests, high electrical field, discharges processes.

Population of grain pests reaches 37%. According to FAO annually insect pests of grain reserves eat up to 15% of grain produced in the world and in some countries – up to 50%. Affected grain is contaminated by waste of their life, bread bakes bad, toxic uric acid salts, which soaked the waste, hitting to bread and then to stomach of man or animal, causing disease. Such products can not be consumed.

Nowadays disinsection belongs to means of active pest control. There are three ways of disinsection – fumigation, wet and aerosol treatment. Special preparations are using for fumigation. They are based on acting chemicals – aluminum phosphide, magnesium phosphide and methyl bromide, which are quite toxic.

The requirements for fumigation: complete sealing of storage space; silos should be fully loaded with grain; necessary to maintain certain temperatures. Disadvantages of fumigation – impossible processing of individual parts of grain; you can not interrupt the process of treatment; inefficient treatment against bread ticks; grain is not protected from reinfection; risk of intoxication people by gas; long stopping of factory. It is necessary to conduct degassing to remove the fumigant from treated sites after the exposure fumigation. After grain decontamination it is determining the quality of fumigation. It is necessary to spend additional disinsection if there are live pests in the grain mass.

Methodes and devices (which were developed at department of electric drive and electric technology of NULES of Ukraine, and they use electrophysical processes that take place in the grain mass under influence of high electric field) were used in the basis of the development of grain processing technologies in the high electric field.

The processing grain is placed between plane-parallel plate electrodes to which a high voltage is supplied. The feature of this type of treatment is that the grain mass, microflora and insect pests are influenced by the following impacts: a high electric field; surface and volumetric current; ionization processes in the airspaces of the grain mass; air ions and ozone, which is formed by the action of partial discharges.

It is used a high voltage source of pulsed current to expand technological possibilities, especially increase productivity of ozone synthesis, which provides environmentally friendly disinsection. Using of this source provides a significant increase of intensity of partial discharges in air inclusions of the grain mass compared with DC or AC sourses, and therefore the amount of ozone. It was established that the frequency of partial discharge with using of high voltage source of pulsed current is 45.64 kHz, which is 50 times more than the high-voltage transformer – 899,76Hts.

To increase the productivity of ozone synthesis and mixing of grain mass during its movement it was entered additional zigzag metal electrodes in the processing cell. They are located along the plane-parallel electrodes and attached to the walls of the processing cell, and they no have no electrical contact with a high voltage source. It takes place a polarization at additional electrodes by high electric field and electric charges are accumulated at zigzag tops of electrodes. It makes artificial centres of strongly inhomogeneous electric field and additional centres of partial discharges. In result it increases the intensity of partial discharges and concentration of ozone.

It is possible to increase the discharge rate value to 62.73 kHz, which is 1.4 times more than without additional electrodes at the same voltage values.

The use of high voltage source of pulsed current and additional zigzag electrode has allowed to increase the frequency of partial discharges in air inclusions of the grain mass in 70 times compared with the use of AC sources with the same operational parameters.

The technology allows to achieve complete destruction of grain pests.