

**USE OF DIFFERENT METHODS FOR WASTE WATER TREATMENT  
(ВИКОРИСТАННЯ РІЗНИХ МЕТОДІВ ОЧИЩЕННЯ СТІЧНИХ ВОД)**

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*У статті розглянуто різні методи очищення стічних вод та їх принцип дії. Визначено використання фільтрації, аеробних і анаеробних методів для знешкодження води. Зазначено, що процеси очищення стічних вод можуть відбуватися в біоінженерних очисних спорудах, біоплатах, в полях зрошеннях, аеротенках, метантенках.*

**Ключові слова:** *очищення стічних вод, біологічний метод, автотрофи, гетеротрофи, анаеробний метод, аеробний метод.*

*The article discusses various methods of wastewater treatment and their principle of action. The use of filtration, aerobic and anaerobic methods for water decontamination is determined. It is noted that the processes of wastewater treatment can take place in bioengineering treatment facilities, bioplats, in field splices, aerotanks, and methane tanks.*

**Keywords:** *wastewater treatment, biological method, autotrophs, heterotrophs, filtration, anaerobic method, aerobic method.*

As a result of human industrial and domestic activities, the balance in reservoirs is disturbed, and therefore the water quality in them deteriorates. Waste from sewage entering natural objects is characterized by a high level of toxicants and other harmful substances. Therefore, there is a need for the development and application of ecological, safe and effective methods of wastewater treatment [1].

Wastewater treatment is a complex process aimed at reproducing the qualitative characteristics of polluted water for the possibility of its further economic use. This process involves reducing the content or removing from it polluting components: organic substances, colloidal or suspended solid particles, as well as the destruction of disease-causing bacteria, etc. The most ecological and safe method of water treatment of industrial and domestic waste is biological method [1]. In this method, this process is carried out by a biocenosis (bacteria, simpler) and a

number of more highly organized organisms (algae, fungi, etc.) connected to each other in a single complex by complex relationships [2].

Two groups of bacteria participate in the process of wastewater treatment: heterotrophs and autotrophs. Heterotrophs use carbon from ready-made organic substances processed by them to obtain the energy necessary for the biosynthesis of cells. Autotrophs, in turn, use inorganic carbon for cell synthesis, and energy is obtained as a result of photosynthesis or chemosynthesis (oxidation of some organic compounds: ammonia, nitrites, ferric salts, hydrogen sulfide, etc.) [2].

One of the biological methods of wastewater treatment is filtration, which is carried out through special bioengineering treatment facilities - bioplateaus or bioponds. Such structures are inhabited by various groups of higher aquatic plants that consume water-soluble pollutants (sulfates, nitrates, petroleum products, etc.) and are able to use them in the process of vital activity [1]. There are also aerobic and anaerobic methods of wastewater treatment.

The aerobic method is a method that uses microorganisms (aerobes) that need oxygen for their vital activity and maintain the temperature of the environment at 20-40 °C [1]. Purification of water under aerobic conditions is carried out using biofilters or by cultivating microorganisms in activated sludge, the biocenosis of which consists of various groups of living organisms (bacteria, worms, fungi, algae, crustaceans) and solid substrates [3]. The aerobic cleaning process can be presented in the form of the following reaction:



This scheme describes the process of oxidation of organic substances in wastewater and the formation of new biomass, and biologically non-oxidized substances remain in the water in a dissolved state, as colloidal and insoluble substances are removed from wastewater by the sorption method. This process can be carried out both in natural conditions (irrigated fields, filtration fields and biological ponds) and in artificial structures (aeration tanks). This cleaning can take place normally if the concentration of organic matter in disinfected water, expressed in biological oxygen demand, does not exceed a certain value. In this regard, during biological treatment, concentrated wastewater is diluted with weakly concentrated domestic wastewater, and in some cases with clean water [3].

The anaerobic method of wastewater treatment consists in the use of anaerobic microorganisms that do not need oxygen for their vital activity.

This method is used to neutralize solid sediments formed during mechanical, physico-chemical and biological wastewater treatment. These solid deposits are fermented by anaerobic bacteria in special hermetic tanks - methane tanks [3].

Depending on the final product, fermentation can be alcoholic, lactic, methane, etc. Methane fermentation is used for fermentation of sewage sludge, it occurs according to the reaction:

$C_6H_{12}O_6 \rightarrow 3CH_4 + 3CO_2 + \text{microbial biomass} + \text{heat}$ .

Anaerobic degradation of organic substances during methanogenesis is carried out as a multi-stage process, which requires the participation of at least four groups of microorganisms: hydrolytics, fermenters and methanogens.

The advantage of this method of wastewater treatment is the high speed and use of substances in low concentrations, as well as the relatively small formation of microbial biomass. It is important to know that the main disadvantage of this process is the release of combustible gas - methane, as a result of the activity of anaerobes. For this reason, certain limitations apply to the application of anaerobic cleaning techniques [3].

Wastewater treatment by various methods is a complex process of transforming organic substances in toxic industrial or other polluted water into safe, environmentally clean water. These processes can take place in bioengineering treatment facilities, bioplants, in fusion fields, aeration tanks, and methane tanks.

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### **TECHNOLOGY OF PRODUCTION AND PROCESSING OF PIG PRODUCTS (ТЕХНОЛОГІЯ ВИРОБНИЦТВА І ПЕРЕРОБКИ ПРОДУКЦІЇ СВИНАРСТВА)**

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**Ключові слова:** *свинарство, технологія, продукція, виробництво.*

*The article is devoted to the technology of production and processing of pig products.*