

WASTEWATER TREATMENT IN NATURAL CONDITIONS

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Abstract: INTRODUCTION: Water plays an important role in the main processes occurring in nature, as well as in human life. In industry, water is used as a source of raw materials and energy, as a coolant or heater, as a solvent, as an extractant, as a means of transporting raw materials and materials, and for a number of other needs.

MATERIALS AND METHODS: Industrial wastewater is generated during the processing and extraction of organic and inorganic raw materials. The sources of wastewater generation in technological processes include: 1) water generated as a result of chemical reactions (which are contaminated with starting materials and reaction products); 2) water in the form of free and bound moisture in raw materials and primary products, as well as moisture generated during processing processes; 3) water generated after washing raw materials, products and equipment; 4) running aqueous solutions; 5) aqueous extracts and absorbents; 6) cooling waters; 7) other wastewater; water from vacuum pumps, mixing condensers, hydrosol losses, washing of containers, equipment and buildings.

Key Words: 1) biologically unstable organic compounds; 2) low-toxic inorganic salts; 3) petroleum products; 4) biogenic compounds; 5) specific toxic substances

The aerobic process of biochemical treatment is carried out in natural conditions and in artificial structures. Wastewater treatment in natural conditions is carried out in landscaping and filtration areas and in biological basins. Artificial structures include aerotanks and biofilters of various structures. The type of structure is selected taking into account the location of the enterprise, its conditions, water supply sources, the volume of industrial and domestic wastewater, the concentration and composition of impurities. The process of wastewater treatment in artificial structures proceeds much faster than in natural conditions. Landscaping area. This is a specially prepared plot of land used for wastewater treatment and agro-industrial purposes at the same time. In such conditions, wastewater treatment occurs under the influence of the movement of the sun and air, the vital activity of plants. Landscaping areas contain bacteria, actinomycetes, yeasts, algae, protozoa and invertebrates. Wastewater is mainly composed of bacteria. In mixed biocenoses in the active layer of the soil, a complex interaction of symbiotic and competitive microorganisms occurs. The number of microorganisms depends on the seasons. They are less in winter than in summer. If the land area is not planted with agricultural crops and they are intended for biological treatment of wastewater, such areas are called filtration areas. After biological treatment of wastewater from the land in the land of landscaping, the fertilizers are used for growing cereals, various vegetables, as well as trees.

Landscaping areas have the following advantages over aerotanks: 1) material and labor costs are reduced; 2) wastewater is not discharged outside the land of landscaping; 3) high and stable yields of agricultural plants are ensured; 4) low-yielding lands are attracted for agriculture. During the biological treatment

process, wastewater passes through the filtering layer of the soil, where suspended and colloidal particles are retained, and microbial films are formed in the pores of the soil. The resulting film adsorbs colloidal particles and substances dissolved in wastewater. Oxygen entering the pores from the air converts organic substances into mineral compounds and oxidizes them. It is difficult for oxygen to penetrate deep layers of the soil. Therefore, oxidation proceeds better in the upper layer of the soil (0.2-0.4 m). When there is a lack of oxygen in the soil layers, anaerobic processes prevail in the soil layers. For this reason, landscaping areas should be built on sandy, black soil. Wastewater treatment, using both irrigation and fertilizer at the same time, can be carried out in 3 options: 1) after mechanical treatment, wastewater flows into water collection basins, then along the canal to evaporation basins and into the landscaping area; 2) after physico-chemical treatment, wastewater flows into a biological basin, then into the landscaping area or first into a filtration area, and then into the landscaping area; 3) after mechanical, physico-chemical, biochemical treatment, wastewater is directed to the landscaping area, and during the non-irrigation period, wastewater is discharged into water basins. Biological basins consist of 3-5 stages, through which biologically purified or clarified water slowly passes. The basins are designed for biological treatment and final purification of wastewater in conjunction with other treatment facilities. In addition, there are basins with natural or artificial aeration. A basin with natural aeration has a depth of 0.5-1 m, warms up well in the sun and contains aquatic organisms. Bacteria use the oxygen released by algae during photosynthesis, as well as oxygen from the air, to oxidize impurities. Algae, in turn, consume carbon dioxide, phosphates and ammonium nitrogen, which are formed during the biochemical decomposition of organic matter. In winter, the basins do not operate. Aerobic and anaerobic methods of biochemical treatment of wastewater are used. The aerobic method is based on the use of aerobic microorganisms that require a constant flow of oxygen and a temperature of 20-40 ° C for their vital activity. In aerobic wastewater treatment, microorganisms are grown in activated sludge or biofilm. Anaerobic treatment methods operate without the participation of oxygen and are mainly used to neutralize sediments. Activated sludge consists of living organisms and a solid substrate. Living organisms include a collection of bacteria and single bacteria, protozoa, molds, yeast, actinomycetes, and in some cases crustaceans and insect larvae, as well as algae, etc. The complex of all living organisms living in activated sludge is called a biocenosis. Such a biocenosis consists of 1-2 species of microorganisms and protozoa. The bacteria collected in activated sludge are surrounded by a mucous layer (capsules). Such collections are called zoogleya. They help improve the structure of the sludge, sedimentation and thickening. Mucous substances contain antibiotics that destroy filamentous bacteria. Bacteria separated from the mucous layer oxidize impurities very slowly. Activated sludge is an amphoteric colloidal system with a negative charge in the pH range of 4–9. Despite the significant differences in the level of wastewater, the elemental chemical composition of activated sludge is close to each other. For example, the chemical composition of activated sludge in coke-chemical plant wastewater treatment systems is in wastewater treatment systems for nitrogen fertilizer production, , and in municipal wastewater treatment systems, $C_{97}H_{199}O_{53}N_{28}S_2$

The dry matter of activated sludge consists of 70–90% organic and 30–10% inorganic substances. Different groups of microorganisms settle in activated sludge. The occurrence of such groups depends on the composition of wastewater, the amount of oxygen in it, temperature, environmental reaction, salt content, oxidation-reduction potential and other factors. According to ecological groups, microorganisms are divided into aerobic and anaerobic, thermophilic and divided into mesophiles, halophiles and halophobes. Aerobic microbes are widely used in the treatment of industrial wastewater.

The quality of activated sludge is determined by its settling rate and the degree of wastewater purification. Large sludge settles faster than fine sludge. The state of the sludge is characterized by the Sludge Index. It shows the dependence of the volume of the settled part of the activated sludge on the mass of the dried sludge (in grams) after 30 minutes of settling.

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