INCREASING WASTEWATER TREATMENT EFFICIENCY USING HYDROBIONTS

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Abstract: This article is focused on wastewater treatment using hydrobionts and was conducted in the Bukhara water supply. As a result, in order to ensure the activity of microorganisms in the treatment plant and increase the efficiency of high purification, it was achieved to ensure that the oxygen content in the aeration tank was not lower than 4.6 mg/l and the IL index was not lower than 150 mg/l. It was recommended to use the treated wastewater for irrigation of technical crops and ornamental plants.

Аннотация: В данной статье рассматривается очистка сточных вод с использованием гидробионтов, проведенная в системе водоснабжения г. Бухары. В результате, с целью обеспечения жизнедеятельности микроорганизмов на очистных сооружениях и повышения эффективности глубокой очистки, удалось обеспечить содержание кислорода в аэротенке не ниже 4,6 мг/л, а индекс ИЛ – не ниже 150 мг/л. Очищенные сточные воды рекомендовано использовать для орошения технических и декоративных культур.

Annotatsiya: Ushbu maqola oqava suvlarni gidrobiontlar yordamida tozalashga qaratilgan bo'lib, Buxoro suv ta'minotida olib borilgan. Natijada tozalash inshootlarida mikroorganizmlarning faolligini ta’minlash va yuqori tozalash samaradorligini oshirish maqsadida aerotankdagi kislorod miqdori 4,6 mg/l dan, IL indeksi esa 150 mg/l dan past bo‘lmasligiga erishildi. Tozalangan oqava suvlardan texnik ekinlar va manzarali o‘simliklarni sug‘orishda foydalanish tavsiya etildi.

Keywords: wastewater, hydrobionts, treatment, seriobacteria, Infusoria.

Today, the results of global climate change are having a dramatic impact on the climate of Uzbekistan. In particular, the drying up of the Aral Sea in the span of a generation (over 60 years) and the emergence of the Aral Desert on its territory of 5 million hectares are creating complex socio-economic and ecological problems in the oasis. Such complex processes are reflected in the ecosystems of the Bukhara region. High temperatures, drought, desertification are leading to a shortage of drinking and irrigation water from year to year. The treatment and reuse of generated technical and domestic wastewater are factors that mitigate the problems that have arisen. For this reason, the Bukhara city wastewater treatment plant was selected as an object for conducting scientific and practical work, monitoring, sampling, conducting chemical and biological analyzes, and conducting test experiments.

The Bukhara City "Wastewater Treatment Plant" belonging to the "Bukhara Water Supply" Limited Liability Company was commissioned in 1972 and the initial treatment was mechanical. The facility consisted of a building of iron barriers (rings), sand traps, primary clarifiers and biological artificial ponds (biopruds), through which wastewater was treated and discharged into the Sakovich ditch. In 1984, the design capacity was 100 thousand / m, additional primary clarifiers, aerotanks, an air pumping station, secondary clarifiers, sludge collection areas, and chlorination buildings were built and commissioned in 1985. However, the volume of wastewater entering the treatment plant reached 45-50 thousand / m due to the wastewater of the Bukhara Textile Combine. The composition of the wastewater was strongly alkaline, acidic, microorganisms died in the aeration tank and the IL index was 50-60 mg / l, and the overall efficiency of the facility was 30-40%. In accordance with the Resolution of the President of the Republic of Uzbekistan No. PQ-1216 dated October 29, 2009 "On measures to implement the project "Reconstruction of treatment facilities and sewage systems in the cities of

Bukhara and Samarkand", in 2014-2016, the 1st phase of reconstruction work was carried out at the facility. The building of the chanbaraklar, sand traps, primary clarifiers, aeration tanks, secondary clarifiers, were reconstructed, and 6 air pumping stations were re-equipped with modern equipment.

The processes of wastewater treatment from suspended solids continue in the primary clarifier. The primary clarifiers consist of 4 radial clarifiers with a capacity of 25 thousand m, 2 of which are working and 2 are in reserve. The primary clarifiers consist of settling the suspended impurities in the wastewater for 2 hours in accordance with the wastewater treatment time (regulation). In the facility, wastewater is cleaned of 65-70% of suspended solids under the influence of centrifugal force during the rotation of special buckets and falls into the aerator, into which air is supplied under strong pressure. The amount of dissolved oxygen in the water is brought to 4-6 mg. As a result, biodiversity (bacteria, soda animals, amoeba, crayfish, infusoria) develops in the water. [3,6]

While the average ammonium content in wastewater was 77.8 kg/m3 per hour in spring, this indicator increased to 84.8 kg/m3 in summer. Similarly, nitrites in wastewater also have a seasonal character, with their content in spring being 4.5 kg/m3, in summer 4.5 kg/m3, in autumn an average of 4.1 kg/m3 and in winter 1.3 kg/m3, while nitrates range from 3.8 to 2.3 kg/m3 from spring to winter. The amount of phosphates was recorded in the range of 4.6-7.7 kg/m3. The maximum indicator of the amount of suspended solids in wastewater is 389.2 kg/m3 (in summer) and the minimum is 353.8 kg/m3 (in winter). The composition and amount of mineral salts was recorded at 249.2-287.8 kg/m.

In order for the ammonium salts and nitrogen nitrites contained in the wastewater to be completely decomposed into nitrate ions in the aeration tank, the active clay index in the aeration tank should be 200-250mg/l and the dissolved oxygen content in the water should be 4-6 mg/l, and its active participation in the purification process should achieve the complete decomposition of organic substances contained in the wastewater. The second important factor is the ratio of air pumped into the aeration tank, which is 4-4 m to 1 m of air. The duration of complete purification of wastewater in the aeration tank is 10-12 hours.

As a result of the experiment, it was noted that the organic matter content of wastewater in the aeration tank is primarily determined by the activity and quantity of bacteria. According to A.G. Rodina (1965), the decomposition of organic pollutants in wastewater by bacteria occurs in a logarithmic graphic phase, and in the remaining stages, the bacteria pass into the zoogel (turbid) phase. It is possible to observe the diversity of the composition of microorganisms during the decomposition period with the participation of aerobic bacteria participating in the nitrification process of wastewater. Microorganisms are based on the use of organic matter in wastewater as food for their vital activity. With the acceleration of the nitrification process in wastewater, that is, with the increase in the amount of dissolved oxygen in water (4-6 mg / l), ammonium salts, nitrogen dioxide into nitrates, representatives of the kolvratka began to dominate in the active composition of the active layer, replacing sedentary and free-swimming infusoria. Among these, several species of Brachionus, Microcolidia, Asplanchia, and Keratella were found to be among the dominant species, as reflected in the analyses and tests conducted.

The fully treated wastewater was passed through biopонds, neutralized, and tested in several stages for 48 hours using the zooplankton representative Daphnia longispina Mull. In the experiment, it was noted that 85-90% of thetest experiments conducted using 5-7-day-old nauplii (larvae) of Daphnia survived.

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