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THE BIOLOGICAL SEWAGE DISPOSAL IN LOCAL TREATMENT FACILITIES OF OBJECTS OF INDIVIDUAL RESIDENTIAL BUILDINGS

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БИОЛОГИЧЕСКАЯ ОЧИСТКА ХОЗЯЙСТВЕННО БЫТОВЫХ СТОКОВ В ЛОКАЛЬНЫХ ОЧИСТНЫХ СООРУЖЕНИЯХ ОБЪЕКТОВ ИНДИВИДУАЛЬНОЙ ЖИЛОЙ ЗАСТРОЙКИ

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Статья посвящена актуальной на сегодняшний день проблеме очистки хозяйственно-бытовых стоков. Рассмотрена перспектива использования метода биологической очистки в локальных очистных сооружениях «ЛОС» объектов индивидуальной жилой застройки. Значительное внимание уделяется исследованию параметров функционирования активного ила и возможности его адаптации к условиям ЛОС конкретного «данного» объекта. Предлагается конструкция ЛОС с высокой степенью устойчивости к залповым «большого количества» сбросам бытовых сточных вод, позволяющая использовать данное сооружение в различных климатических условиях.

Introduction In the context of widespread environmental contamination, including deterioration of natural waters quality, the problem of providing people with drinking water of high quality becomes one of the most urgent problems of human survival. One of the modern methods of domestic wastewater treatment is biological

treatment [1]. Most often, this treatment method is realized in the flow treatment facilities. However, this scheme of cleaning is not acceptable to the objects of individual residential development, where there is also a need for domestic wastewater treatment. In connection with the above we can say that development of local treatment facility «LTF» biological treatment of household sewage objects of individual residential development is urgent.

Biological «or biochemical» method of wastewater treatment is used for the treatment of industrial and domestic sewage from organic and inorganic pollutants. This process is based on the ability of some microorganisms to use polluting wastewater substances for food during their life [2].

The main process occurring biological wastewater treatment is a biological oxidation. This process is carried out by a community of microorganisms «ecosystems», consisting of variety of different bacteria, algae, protozoa, fungi, and others interconnected into a single set of complex relationships of «metabiosis, symbiosis and antagonism». The leading role in this community belongs to the bacteria [2].

Activated sludge is a process for treating sewage and industrial wastewaters using air and a biological floc composed of bacteria and protozoa [3].

Activated sludge – sludge particles produced in wastewater by the growth of organisms in aeration tanks. The term ‘activated’ comes from the fact that the particles teem with bacteria, fungi, and protozoa. Activated sludge is different from primary sludge in that the sludge particles contain many living organisms that can feed on the incoming wastewater [4].

Activated sludge process – a biological wastewater treatment process which speeds up waste decomposition. Activated sludge is added to wastewater, and the mixture is aerated and agitated. After a certain amount of time, the activated sludge is allowed to settle out by sedimentation and is disposed of «wasted» or reused «returned to the aeration tank» [4].

The method of biological sewage treatment can be implemented under both aerobic and anaerobic conditions. In this work the scheme of aerobic process of biological cleaning is presented [5].

Like any living system, a biocenosis of active sludge has certain operating conditions. Extent of sewage treatment depends on the values of abiotic environmental factors of active sludge. Important factors that negatively affect the formation of active sludge, are imbalance in the ratio of nutrients in wastewater, fluctuations in environmental pH, effects of light, temperature, and aeration, changes in the surfactants concentration, the salinity etc. For example, significant increase of maximum permissible concentration «MPS» for nitrogen and phosphorus «in 4, 6, 8 times» sharply reduces the total number of microorganisms, species diversity, some particularly sensitive species are eliminated from the composition of the sludge. That is the proportion of biogenic elements determines the total number of biocenosis organisms [6].

At pH 1–5 values organisms in active sludge die. The optimal pH for the development of active sludge biocenosis should be considered for the range of pH 6–8. It should be noted that organisms in active sludge tolerate easily changing the pH of the environment in the direction of increasing alkalinity rather than the increase of acidity [6].

The change in light level is first of all reacted by the representatives of protozoofauna. Total loss or encystation in the absence of light can lead to loss of their ecological niches in the food pyramid of active sludge biocenosis, which, as a consequence, may disrupt the normal operation of treatment facility [6].

Aerobic cleaning by bacteria can be carried out at temperatures ranging from 10 °C to 35 °C, but the optimum productivity is achieved in the range of 18–32 °C. Air supply into the treatment facility should provide

requirement of dissolved oxygen of about 2 mg / l, in order to achieve an appropriate biological consumption of oxygen within 5 days «BCO_5» and for breathing of cell mass, and also for mixing and retention of active sludge in suspension [7–8].

During the research it was shown that the surfactant concentration in waste water up to 1,0 g / l did not significantly change in the species composition of the sludge. The salinity level of less than 1 % does not affect the functioning of active sludge.

Thus, the study of the influence of abiotic factors on the active sludge biocenosis shows its high inertia capacity, able to «extinguish» short-term toxic effects.

The use of activated sludge in wastewater treatment processes imposes certain requirements on the design for LTF objects of individual residential buildings. Proposed in this paper the LTF design allows to neutralize such factors as climatic conditions of the region where the object of residential development is placed, as well as the multiple wastewater discharges.

Operation of the treatment facility is not limited by specific conditions and allows households to use sewage system in normal mode, including the use of surfactants and other active substances in volumes and concentrations, specific to the conditions of housekeeping.

For example, the proposed construction of a water treatment facility provides the sewage dilution, held earlier purification of water. Thus, we can say that in this scheme of wastewater treatment surfactants, salinity and concentration of other polluting components cannot have a significant impact on the species composition and functioning of active sludge. The temperature regime of the source of wastewater is adapted to the real temperature of wastewater from individual houses, as even in case of ingress of cold or hot water in the sewage treatment facility, after dilution water temperature will correspond to the optimal and will not affect the work «productivity» of active sludge. The power of this type of treatment facilities can also be easily adapted to the required quantities of wastewater.

Another advantage of this type of treatment facilities is the generation of wastes in the process of wastewater treatment, which can be used as a source of biogenic components on the plot. At present there are quite a number of methods of recycling of active sludge waste that makes biological purification of water an effective and efficient method [9].

Thus, as a result of the research the optimal parameters of the active sludge of certain composition were determined. The LTF construction for biological purification of wastewater of individual residential construction, which allows achieving the required power and the degree of purification of sewage, is proposed. This type of LTF is the least expensive in comparison with analogues existing in the Russian market. Such design of LTF can be easily adapted to the climatic conditions of the region.

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ВЛИЯНИЕ РАЗЛИЧНЫХ ФАКТОРОВ НА ВЫХОД 4(5)-НИТРОИМИДАЗОЛА В ПРОЦЕССЕ ЕГО СИНТЕЗА

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INFLUENCE OF VARIOUS FACTORS ON SYNTHESIS ON EXIT 4(5)-NITROIMIDAZOLE IN THE PROCESS OF ITS SYNTHESIS

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There were studed synthesis of 4(5)-nitroimidazole at work. In the article process of nitration of imidazole by inorganic nitrate salts is described. The main purpose of the work was research of influence temperature conditions, molar rations and concentration of reagents and time of synthesis for an exit of the target product. These data allow us to conclude of the key factors influencing process of nitration of imidazole and to select optimum conditions for the high exit of 4(5)-nitroimidazole.

В последнее время активно развивается химия имидазола и его функциональных производных. Это связано с тем, что в ряду данных соединений синтезированы вещества, которые находят применение в медицинской практике, текстильной промышленности, радиотехнике, сельском хозяйстве и т.д. Имидазол представляет собой гетероцикл, содержащий в себе одновременно гетероатомы пиррольного и пиридинового типа [1]. Этот гетероцикл – один из самых распространенных, играющий ключевую роль в живых организмах. Он входит в состав пуриновых оснований, витамина B_{12}, многих ферментов. Имидазол находится в группе химических противогрибковых лекарственных веществ, некоторые из них применяются в качестве антигельминтных средств.

Среди соединений группы имидазола особое значение имеют нитропроизводные, которые занимают