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TECHNOLOGY OF WATER RESERVOIRS CLEANING OF VARIOUS ORIGIN AND SPECIAL PURPOSE IN ZHEJIANG PROVINCE

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In connection with the current situation in China: the rapid development of various industries (metallurgical, oil refining, chemical), agriculture, transport infrastructure and other types of anthropogenic activities, wastewater treatment is one of the leading and actual problems of our time, so as the quality of water in natural reservoirs does not meet regulatory requirements. The fight against sewage pollution in this respect is particularly important since waste products of household fluids have a direct impact on the hydrological system of the terrain. In connection with this, more effective means of minimizing negative environmental impact processes are being developed.

Stationary and mobile natural and sewage treatment stations are increasingly being used in modern times to optimize the quality of water in natural and artificial water bodies of various origins and purposes.

Due to the wide variety of soluble and insoluble contaminants in the waste water, it is not possible to create a universal way of neutralizing and removing them. Therefore, in modern times, a whole set of techniques are used, each of which is oriented to work with a particular group of substances

Currently, all countries in the world, without exception, the most rational and environmentally acceptable methods of purifying natural reservoirs are biological methods that are a complex of methods for purification of water, soils and the atmosphere using the metabolic potential of biological objects - plants, microorganisms, insects, worms and other organisms that have received the name of bioremediants. Equally effective and environmentally friendly are also complex purification methods, which are a combination of biological and mechanical methods in which a biological component can play both a basic and a subordinate role.

Keywords: Natural reservoir, ecological system, self-purification, self-healing, biological balance, natural aging of the reservoir, organic matter accumulation, sewage, bottom sludge, decomposition, dissolved oxygen, nitrogen, phosphorus compounds, violation of biological equilibrium, toxins, alkaloids, cleaning methods.

Foundation for Research. The global man-made load causes significant pollution of the environment, which is associated with the expansion of the scale of production, the imperfection of purification technologies that are used.

Especially it concerns emissions in the hydrosphere. Especially this concept is important for large and small reservoirs of Zhejiang Province, the pollution of which is quite high.

One of the main polluters of natural reservoirs in Zhejiang province are industrial, domestic and agricultural wastewater. As the population grows, the consumption of fresh water for industrial, domestic and agricultural needs grows and, accordingly, the amount of sewage increases. Industrial, domestic and agricultural wastewater carrying a different component composition of pollutants and, especially, increased concentrations of organic and biogenic elements, falling into natural water bodies provoke an outbreak of biomass growth of blue-green algae, which adversely affects water quality and fauna of these reservoirs in the warm period year, and in the cold just pollute them.

A natural body of water is a biologically balanced ecological system, tuned to self-purification and self-healing. This natural state of the biological balance can be disturbed both as a result of the natural aging of the reservoir, the accumulation of natural organics in the pond: leaves, branches, feces, waterfowl, dead aquatic plants, and as a result of intensive pollution of the reservoir with organic substances and biogenic elements: garbage, storm sewage, deposits from fields and roads, poorly treated sewage, sewage, fertilizers, which are abundantly delivered to the body of organic matter. Once in the pond, organic substances partially dissolve in the water, partially descend to the bottom of the reservoir, where they form the organic biomass of the bottom mud, which is continuously decomposed by putrefactive bacteria and fungi. When decomposed, organic substances intensively take dissolved oxygen out of the water, releasing into the water decomposition products – compounds of nitrogen, phosphorus. Excess in the body of organic substances and products of their decay leads first to a violation of biological equilibrium and suppression of the natural biological process of self-purification of the reservoir and then to a change in the type of pond or lake ecosystem to eutrophic - i.e. prone to waterlogging. Signs of intensive pollution include a high level of bottom sediment, high water turbidity, especially in the warm period, a film on the surface of a water mirror, an unpleasant odor, active gas formation, periodic fish and other aquatic animal freezes, uncontrolled reproduction of phytoplankton: blue-green algae, mud, duckweed. Outbreaks of reproduction of blue-green algae («flowering» of the reservoir) alternate with frosts, the decomposition of the biomass of dying blue-green algae takes the vital oxygen from the water and produces nutrients for a new mass «flowering». especially in calm, nutrient-rich waters. Some species of blue-green algae produce toxins that affect animals and humans. The most frequent and serious health consequences occur when drinking water containing toxins (cyanobacteria), or its entry into the body during recreational water use (PHENOLS, DIOXIN).

Toxins of cyanobacteria are classified by their effects on the human body. Hepatotoxins (affecting the liver) are produced by some strains of cyanobacteria Microcystis, Anabaena, Oscillatoria, Nodularia, Nostoc, Cylindrospermopsis and Umezakia. Neurotoxins (affecting the nervous system) are produced by some strains of Aphanizomenon and Oscilatoria. Cyanobacteria of the species Cylindroapermopsis raciborskii can also produce toxic ALKALOIDS that cause gastroenterological symptoms or kidney disease in people.

With the death of algae in your pond, a large number of organic substances appear that settle on the bottom of the pond, where they decompose by microorganisms, which leads to oxygen deficiency, and to the appearance of new biogenic (nutrient) substances that are available for the next generation of plants.

Pollution of the reservoir primarily affects the key element of biological equilibrium and self-purification of the reservoir – the composition of the beneficial microflora of the reservoir (biosensors). Number of beneficial microorganisms in 1 ml. contaminated water is sharply reduced, impoverished and their species composition is changing, at the same time, potentially dangerous microorganisms functioning at +30 – + 37°C are actively developing in dirty water, which is observed in the region of research. Thus, microbial self-purification and self-disinfection of the reservoir are suppressed by pollution. The reservoirs with the disturbed microbiological self-purification are supersaturated faster not by the oxidized organics and biogenic elements, which irreversibly leads to eutrophication (swamping) of the reservoir-a change in the type of the aquatic ecosystem of the pond or the lake into a marshy ecosystem. To save and restore the reservoir, intensive purification of water and bottom sediments from rotting organic matter and biogenic elements is needed, restoration of the oxygen regime and mechanisms of biological self-purification of the reservoir. The struggle against pollution of the reservoir with blue-green algae, mud, duckweed is also not considered separately from the treatment of the reservoir from organic and biogenic contamination, restoration of biological balance and self-purification.

The status of research in the country and abroad. Development trends. In connection with the current situation in China: the rapid development of various industries (metallurgical, oil refining, chemical), agriculture, transport infrastructure and other types of anthropogenic activities, wastewater treatment is one of the leading and actual problems of our time, so as the quality of water in natural reservoirs does not meet regulatory requirements. The fight against sewage pollution in this respect is particularly important since waste products of household fluids have a direct impact on the hydrological system of the terrain. In connection with this, more effective means of minimizing negative environmental impact processes are being developed.

Stationary and mobile natural and sewage treatment stations are increasingly being used in modern times to optimize the quality of water in natural and artificial water bodies of various origins and purposes.

General Technology. Due to the wide variety of soluble and insoluble contaminants in the waste water, it is not possible to create a universal way of neutralizing and removing them. Therefore, in modern times, a whole set of techniques are used, each of which is oriented to work with a particular group of substances.

Methods of water purification can be divided into 2 large groups: destructive and regenerative.

The destructive methods are based on the processes of destruction of pollutants. The resulting decomposition products are removed from the water of gases, precipitation or in water, but already in a neutralized form.

Regenerative methods are the purification of water and the utilization of valuable substances that arise in waste.

Methods of water purification can be divided into: mechanical, chemical, hydrochemical, electrochemical, physicochemical and biological. When they are applied together, the water purification method is called combined. The application of this or that method in each given case is determined by the nature of the contamination and the degree of harmfulness of the impurities.

The essence of the **mechanical method** is that mechanical impurities are removed from the sewage by sedimentation and filtration. Coarsely dispersed particles, depending on the size, are captured by gratings, sieves, sand slicers, septic tanks, manure catchers of various designs, and surface contamination by oil traps, gas oil catchers, sedimentation tanks. Mechanical cleaning allows to extract from domestic sewage up to 60-75% of insoluble impurities, and if from industrial to 95%, many of which are valuable impurities, are used in production.

The **chemical method** is that various chemical reagents are added to the water, which is reacted with pollutants and precipitated as insoluble precipitates. Chemical purification achieves a reduction of insoluble impurities to 95% and soluble up to 25%. At the same time, all aquatic organisms must be removed from the reservoir beforehand.

Hydromechanical methods are used for extracting conditionally insoluble coarse dispersed impurities of organic and inorganic substances from wastewater and water bodies by settling, filtering, filtering, centrifuging. To do this, he uses various structural modifications of sieves, gratings, sand sands, sedimentation tanks, centrifuges and hydrocyclones.

Electrochemical methods for cleaning reservoirs from various soluble and dispersed impurities include anodic oxidation and cathodic reduction, electrocoagulation, electrodialysis. The processes that underlie these methods are based on the processes occurring when an electric current passes through a

flowing water. Under the influence of an electric field, positively charged ions migrate to the cathode, and charged negatively to the anode. In the near-cathode space, the processes of reduction take place, and in the pre-anodic space the oxidation processes take place.

Physicochemical methods of water purification are most diverse. These are coagulation, flotation, adsorptive purification, ion exchange, extraction, reverse osmosis and ultraviolet. With the physicochemical method of treatment, finely dispersed and dissolved inorganic impurities are removed from the water and organic and poorly oxidized substances are destroyed.

Biochemical methods of water purification. They are used for cleaning domestic and industrial wastewater from organic and some inorganic (hydrogen sulphide, sulfides, ammonia, nitrates and others.) Substances. The purification process is based on the ability of microorganisms to use these substances for nutrition, conversion to water, carbon dioxide, sulfate-phosphate ion and others. and the amount of its biomass.

Biological method of water purification. Based on the use of the laws of biochemical and physiological self-purification of natural reservoirs. The biological method of wastewater treatment is based on the ability of microorganisms to use organic substances in wastewater as a source of food, resulting in their oxidation of pollutants.

Also, the main methods of water treatment include the following methods:

Clarification – removal of suspended solids from water. It is realized by filtration of water through porous filter elements (cartridges) or through a layer of filter material. Clarification of water by precipitation of suspended solids. This function is carried out by clarifiers, settling tanks and filters. In clarifiers and settlers, water is at a slowed rate, as a result of which precipitation of suspended particles occurs. In order to precipitate the smallest colloid particles that can be suspended for an indefinitely long time, a coagulant solution (usually aluminum sulfate, vitriol or ferric chloride) is added to the water. As a result of the reaction of the coagulant with the salts of polyvalent metals, which in the water, flakes are formed, entrainment of sediments and colloidal substances.

Coagulation is the treatment of water by special chemical reagents for the coarsening of particles of contaminants. It makes possible or intensifies purification, discoloration, deferrization. Coagulation of water impurities is the process of enlargement of the smallest colloidal and suspended particles, which occurs due to their mutual adhesion under the influence of molecular attraction forces.

Oxidation is the treatment of water with air oxygen, sodium hypochlorite, manganese potassium or ozone. Treatment of water with an oxidizer (or a combination thereof) makes possible or intensifies discoloration, deodorization, disinfection, deferrization, demanganation.

Discoloration is the removal or modification of substances that give water a color. It is realized by various methods, depending on the cause of chromaticity. Discoloration of water, i.e., elimination or discoloration of various colored colloids or completely dissolved substances can be achieved by coagulation, using various oxidizing agents (chlorine and its derivatives, ozone, potassium permanganate) and sorbents (active carbon, artificial resins).

Decontamination is the treatment of water by oxidants and / or UV radiation to destroy microorganisms.

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Engineering equipment develops in general directions, which are oriented towards increasing ergonomics and reliability. Therefore, a modern station for treating wastewater and natural water is multifunctional, efficient and easy to manage. Both industrial and domestic drainage systems are equipped with control panels with a wide range of settings. The treatment of wastewater at some sites can also be combined with integrated management systems for the engineering of a fishery farm or enterprise. And this is not speaking about increasing the basic operational capabilities of cleaning equipment, which is achieved through the use of high-tech materials and filtration and cleaning methods with the further use of bioremediation for post-treatment of sewage or natural waters.

In Russia, it is proposed to apply the hydro-wave method for water purification. The **hydro wave method** consists in the following: when a liquid flow passes through a hydrodynamic heat generator, the flow around a «poorly streamlined body» occurs. As a result, vacuum-containing voids are formed in the liquid, within which the vaporization process takes place. And it goes at a temperature well below 100°C (for example, at 30°C), which saves a considerable amount of energy. Additional high-frequency action causes an effective thermo-oxidative reaction, which leads to the destruction of molecules of pollutants, including complex organic compounds and heavy metals.

In the United States, the so-called olio-sponges are used to purify natural reservoirs from petroleum products. This technology works at the nano-level. Atoms of oxidized metal with complex nanostructures penetrate the sponge fibers, giving it the ability to effectively combine with oil in water, thereby

separating these liquids. Olio-sponges can absorb oil products not only from the surface of water, but also under water. In addition, the oil collected by this method can be used for processing.

In Ukraine, innovative cleaning methods are associated with the work of various research institutes. The methods developed at the Institute of Colloidal Chemistry and Water Chemistry of the National Academy of Sciences of Ukraine are based on the use of bioconveyor technologies (fig. 1).

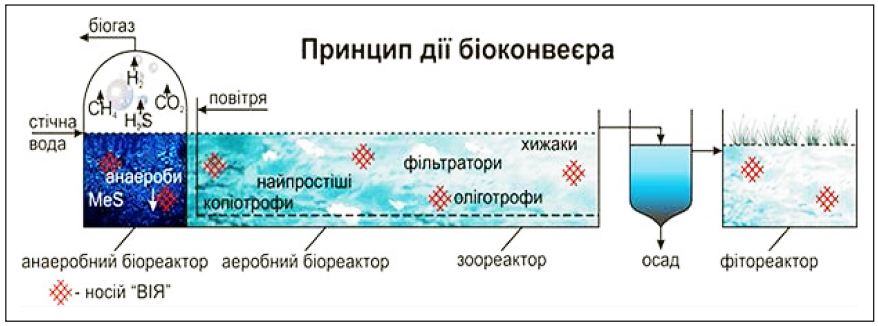

Fig. 1. **Bio conveyor**

The proposed new direct flow of water purification biotechnology – bioconveyors based on the sequential use of selected associations of anaerobic and aerobic bacteria; forming close to natural hydrocenosis, which include a wide range of aquatic organisms - from the simplest to shellfish, fish and higher aquatic plants. The Institute created unparalleled technological qualities of the fibrous carrier «VIA» for immobilizing microorganisms and other aquatic trophic content in wastewater treatment plants that provide any desired degree of purification of waste waters, or natural.

Conclusion. Idea, goals and objectives. The idea of the project is the development of an innovative service for assessing the biological state of water bodies used to grow aquaculture facilities and developing methods for the rapid purification of organically contaminated reservoirs by mechanical, biological and complex methods.

The aim of the project is the creation of innovative methods for the purification of organisms contaminated with organic matter, which can be used in water bodies of various degrees of pollution, of different origin and purpose.

Tasks. 1. Isolation, selection and selection of strains of microorganisms-destructors and their associations, which are distinguished by high metabolic activity; absence of toxic and pathogenic properties. Development of a microbial preparation, creation of various preparative forms of microbial preparations.

2. Development of the technology of complex treatment of organically contaminated reservoirs using mobile units that combine mechanical and biological methods of water treatment.

3. Development of a water treatment technology adapted to the provincial conditions using biofilters.

4. Introduction of innovative methods of mechanical water treatment by cavitation methods.

5. Development of water-purification technology adapted for provinces using aquaponics.

ТЕХНОЛОГІЇ ОЧИСТКИ ВОДИ РІЗНОГО ПОХОДЖЕННЯ ТА ЦІЛОВОГО ПРИЗНАЧЕННЯ В ПРОВІНЦІЇ ЧЖЕЦЗЯН

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У зв'язку з нинішньою ситуацією в Китаї: швидким розвитком різних галузей промисловості (металургійної, нафтопереробної, хімічної), сільського господарства, транспортної інфраструктури та інших видів антропогенної діяльності, очищення стічних вод є однією з провідних та актуальних проблем сучасності, оскільки якість води в природних водоймах не відповідає нормативним вимогам. Боротьба із забрудненням стічними водами в цьому відношенні є особливо важливою, оскільки відходи побутових та технічних рідин мають безпосередній вплив на гідрологічну систему місцевості. У зв'язку з цим розробляються більш ефективні засоби мінімізації негативних впливів на навколишнє середовище.

Стаціонарні та пересувні станції очищення природних та стічних вод все частіше використовуються для оптимізації якості води в природних та штучних водоймах різного походження та призначення.

Через велику різноманітність розчинних та нерозчинних забруднень у стічних водах неможливо створити універсальний спосіб їх знешкодження та видалення. Тому використовується цілий набір методик, кожен з яких орієнтований на роботу з певною групою речовин

У всіх без винятку країнах світу найбільш раціональними та екологічно прийнятними методами очищення природних водойм є біологічні методи, що представляють собою комплекс методів очищення води, ґрунтів та атмосфери з використанням метаболічного потенціалу біологічних об'єктів – рослин, мікроорганізмів, комах, хробаків та інші організмів, які отримали назву біоремедіантів. Не менш ефективними та екологічно чистими є також складні методи очищення, які є поєднанням біологічних та механічних методів, в яких біологічний компонент може грати як основну, так і підлеглу роль.

Ключові слова: природна водойма, екологічна система, самоочищення, самовідновлення, біологічний баланс, природне старіння водойми, накопичення

органічних речовин, стічні води, донний мул, розкладання, розчинений кисень, азот, фосфорні сполуки, порушення біологічної рівноваги, токсини, алкалоїди, методи очищення.

ТЕХНОЛОГИИ ОЧИСТКИ ВОДЫ РАЗЛИЧНОГО ПРОИСХОЖДЕНИЯ И ЦЕЛЕВОГО НАЗНАЧЕНИЯ В ПРОВИНЦИИ ЧЖЭЦЗЯН

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В связи с нынешней ситуацией в Китае: быстрым развитием различных отраслей промышленности (металлургической, нефтеперерабатывающей, химической), сельского хозяйства, транспортной инфраструктуры и других видов антропогенной деятельности, очистки сточных вод является одной из ведущих и актуальных проблем современности, поскольку качество воды в природных водоемах не соответствует нормативным требованиям. Борьба с загрязнением сточными водами в этом отношении особенно важно, поскольку отходы бытовых и технических жидкостей имеют непосредственное влияние на гидрологическую систему местности. В связи с этим разрабатываются более эффективные средства минимизации негативных воздействий на окружающую среду.

Стационарные и передвижные станции очистки природных и сточных вод все чаще используются для оптимизации качества воды в природных и искусственных водоемах разного происхождения и назначения.

Через большое разнообразие растворимых и нерастворимых загрязнений в сточных водах невозможно создать универсальный способ их обезвреживания и удаления. Поэтому используется целый набор методик, каждый из которых ориентирован на работу с определенной группой веществ

Во всех без исключения странах мира наиболее рациональными и экологически приемлемыми методами очистки природных водоемов являются биологические методы, представляющие собой комплекс методов очистки воды, почв и атмосферы с использованием метаболического потенциала биологических объектов - растений, микроорганизмов, насекомых, червей и другие организмов, которые получили название биоремедиантив. Не менее эффективными и экологически чистыми также сложные методы очистки, которые являются сочетанием биологических и механических методов, в которых биологический компонент может играть как основную, так и подчиненную роль.

Ключевые слова: естественный водоем, экологическая система, самоочистка, самовосстановления, биологический баланс, естественное старение водоема, накопление органических веществ, сточные воды, донный ил, разложения, растворенный кислород, азот, фосфорные соединения, нарушение биологического равновесия, токсины, алкалоиды, методы очистки.

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