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Purification Of Natural Waters

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Annotation. The safe drinking water has become one of the main components of the overall autonomous water supply, aimed at satisfying the high demands for the quality of the supplied water and full quality in it, should cover not only technical and economic, but also environmental factors.

In this article was discussed one of the priority tasks is the preparation of drinking water for domestic and drinking purposes from surface water bodies with a limited flow rate and water quality, formed under the influence of natural and anthropogenic factors. Also, were discussed the methods of pre-treatment of water, both natural and complex multi-stage processes, which can be divided into two stages: mechanical filtration - removal of solid impurities, flakes, fibrous inclusions using a filter and chemical treatment - water passes through sedimentary reservoirs, where methods such as clarification, coagulation, protection, filtration dominate. disinfection, demineralization, softening. The results obtained confirm their role in improving the efficiency of water purification processes, their industrial approbation is presented, improved water purification technologies are considered.

Keywords: earth water body, freshening technology, anthropogenic and natural factors of surface water, pretreatment of water, clarification, coagulation. filtration, disinfection, demineralization, softening. testing.

Introduction

As a result of global climate change, increasing numbers of population, the development of industries demand for water in the world and sharp increase demand of economical use of water which is one of the pressing problems today. According to the calculations of industry experts, “under the influence of negative changes, observed on our planet, water shortages could increase by 20% and worsen the lives of 2-5 billion people living in more than 45 countries of the world.

Safety of drinking water has become one of the main components of the overall autonomous water supply, which is aimed at meeting the high demands for the quality of water supplied and full satisfaction in it, should cover not only technical and economic, but also environmental factors.

There is a significant amount of underground water reserves with a relatively stable composition and a higher sanitary level than water from surface sources. The prospective demand for domestic and potable water supply can be fully met by ground water. About 40% of the population still uses drinking water that does not meet hygienic requirements[1,2,3,4,5,6,7]. Providing the population with high-quality drinking water is one of the main state tasks, which has become particularly important due to the deterioration of the overall environmental situation, which is observed almost everywhere, and excessive pollution of water bodies and water supply sources.

Any water on full knowledge, environmental indicators of our life, so a tire will not be possible. Every promising technologist should know the following scientific information about water.

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Natural waters are diverse in their composition, quality and quantity: salty sea water, fresh streams and springs (rivers, underground wells, etc.), snow - rain water, mineralized, in some cases even hot, ground water[8,9,10,11,12].

In areas where there is a shortage of fresh water, the problem of providing small settlements with drinking water is particularly acute. In these cases, an alternative to the high cost of organizing imported drinking water can be justified from a sanitary and hygienic economic point of view, the use of small freshwater lakes fed by spring groundwater with a limited flow rate, and reservoirs formed as a result of regulating small watercourses as sources of domestic and drinking water supply. At the same time, when using such water sources, the selection and justification of the technological scheme of water purification and the search for the necessary investments for the purchase of expensive equipment and reagents is a complex scientific and practical task [13,14,15.] . To solve this problem, it is necessary to analyze the dynamics of changes in the source water quality; determine the possibility of using the most rational water treatment technologies for small water pipes; justify less energy-intensive methods and means of water treatment at the first stage of its treatment; determine the initial data on the design of industrial water treatment facilities based on field studies and conduct a feasibility study.

For the most part drinking water indicators can be brought into line with standards that use leaky or storage systems that are sold in regular stores.

This is a simple and relatively inexpensive cleaning method that requires only periodic cartridge replacement. Flow filters can be integrated directly into the water supply. Modern automatic monitoring and control systems inform the user about contamination of the cartridge or include a cleaning mechanism to restore the filtered container. Domestic installations remove hardness salts, excess chlorine, iron, manganese, dissolved gases, heavy metals, and some microorganisms.

Simple and affordable ways to clean drinking water that will help you get rid of calcium and magnesium ions, iron, hydrogen sulfide, and dangerous bacteria. Boiling is carried out in enamel or glass containers for 15 minutes.

After that, the water can settle and cool down naturally. Impurities, when heated, turn into insoluble compounds and form a precipitate, which must be drained. To protect against dust, it is necessary to store boiled drinking water in an airtight container.

Research methods

Water is poured into a small, clean container and allowed to cool for several hours. The cap is not used to allow the chlorine to freely[19]. After that, the upper layers of water can be used for cooking, and the lower ones should be drained. This cleaning method removes insoluble iron salts, solid impurities, sand and rust particles. It is impossible to protect water for a long time, as bacteria begin to multiply in it, so the method is used only in case of weak contamination of the source.

But it is also important to know that even a stream or river cannot have the same composition and properties in different places (across the river, of course).

In some natural waters, various microorganisms and algae, plankton are a source of insoluble organic compounds. In the summer months, under conditions that promote plankton growth, it was found that the water contains many insoluble organic compounds.

The formation of insoluble organic matter in water occurs in two ways:

1. Heavy rains (floods) or rising temperatures melt large amounts of ice and snow, and as a result large ones streams water is washed off surface areas organisms, various biocenoses;
2. With the development of plankton in the water itself, certain favorable conditions are created.

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The decomposition of organic compounds in the water environment leads to the formation of more stable substances, such as humus, which multiplies in the soil layers. They can be colored or colorless, fragrant or odorless. Of course, depending on the qualitative and quantitative indicators of all types of substances in water, natural waters can also be colored in different colors. An indicator specific to organic matter such as humus and water quality determination, H 2, which consists in the fact that the amount of C is significantly lower than that of C:H=1:10. Such substances are permanganate, dichromate. rapidly oxidized by active chlorine, etc. Under natural conditions, under the influence of biological factors, their oxidation is much more difficult.

Natural water-depends on the salts dissolved in it. Depending on the content of various salts (the degree of mineralization), waters are classified as follows, that is, they are divided into types:

- fresh water water, quantity salts in her before 1 g (l);
- brackish water water, number of salts in them compose 1 -25 g (l);
- salty water, quantity soley in which one makes up more than 25 g (l).

The problem of clean water is caused by an increase in anthropogenic factors in nature, that is, pollution of the environment with various wastes as a result of the activities of many industrial enterprises, agricultural crops, and municipal services, including pollution of wastewater reservoirs. this is the most pressing issue at the moment.

The main components of natural waters.

Natural water - N2O, i.e. pure-is never in the form of water. When it comes to the composition of natural water, of course, this means that gases, liquids and solids are dissolved in it. So far, it has been established that in natural waters there are elementary compounds that make up about half of the periodic table of the periodic table. In addition to the methods of natural composition, there must be complex necessary substances that currently cause the discharge of various drains into water bodies. Natural waters that are generally considered "clean" for consumption are also known and can only be used after preparation and treatment. Once the wastewater is mixed with the waste, it can be used after the unconditional semi-treatment processes are completed. Therefore, in order to use water in practice, of course, you need to know exactly its composition. All types of components mixed with water have two types: insoluble and dissolved.

According to available scientific data(Alyokin, 1970), dissolved compounds in water can be considered mainly as ions, mineral salts, residues of organic and biogenic substances, and gases. There are also many insoluble compounds.

Impurities are found in tap water, and it is difficult to find cleaning equipment, you can buy products in plastic bottles. The manufacturer must indicate on the packaging the composition of the product and the standard according to which it was manufactured. It is difficult to guarantee the safety of such products: it is impossible to say from what source the water was taken and how the drinking water was purified. But for casual use, this option is fine. It is necessary to pay attention to the expiration date and do not violate the storage conditions.

At urban water treatment plants, drinking water is subjected to a complex multi-stage treatment. As a rule, the process can be divided into two stages::

Mechanical filtration-removal of solid impurities, flakes, and fibrous inclusions using a filter

Chemical treatment - water passes through sedimentary reservoirs, dominated by coagulation, clearing, clearing, softening and disinfection reagents.

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lightening. This is the initial stage of cleaning, which is often required when receiving water from wells, lakes, and other open sources. Turbidity and suspensions in water indicate the presence of organic impurities: humic and fulvic acids, colonies of microorganisms. At the clearing stage, chlorine-containing salts and coagulants are added to the stream. The active oxidizing agent destroys organic compounds in the water and causes precipitation. Insoluble agglomerates can then be more easily retained by mechanical filters.

coagulation. The technology is aimed at removing colloidal suspensions from water that are not always visible to the naked eye. Aluminum salts are used as coagulants that cause the adhesion of organic molecules, destroy the shells of microorganisms, forming heavy flakes with impurities. The stream is then directed to settle the tanks.

Security features. Special containers are provided at water supply stations, inside which water flows at a low speed. The lower layers move more slowly than the upper ones, so polluting solids and phloxes of coagulated compounds are deposited. Sedentary masses are removed from the bottom of the tank through a drainage hole.

filtering. Filters with a sorbent load are used to purify drinking water. Previously, activated carbon cartridges were widely used, but today they are gradually being replaced with powdered and granular backfills. The main difference is that it is not water that passes through the load, but a sorbent that is poured into it and mixed. This method of water purification is simpler and more efficient than traditional filtration, it allows you to remove chemical impurities, heavy metals, organic suspensions and surfactants.

disinfection. To eliminate the epidemic danger of water, special treatment is required. Removal of pathogenic bacteria can be carried out by chemical and physical methods, but chlorine is still the most effective disinfection technology. The oxide atoms retain their activity as the flow moves, disinfecting the inner walls of the pipeline.

demineralization. The removal of manganese and iron from water is important for underground sources, especially those located near ore deposits. Demineralization is carried out by the method of aeration-saturation of the air flow with oxygen. Water is fed into special columns, where it bubbles or sprays through nozzles. As a result, unwanted impurities are oxidized and form insoluble compounds. In addition, the water is purified by mechanical filters.

mitigation. The hardness is due to the high concentration of calcium and magnesium salts. To soften water, filters with ion-exchange resin are used, during which metals are replaced with hydrogen or sodium ions, which are safe for human health. This method is expensive, so it is not used on all water-chemical structures. In most urban apartments, drinking water is characterized by increased hardness, which requires the installation of local ion exchange filters.

Upon completion of the water detection system and analysis of the main parameters, the flow is fed to the distribution network. It should be understood that even if the sanitary parameters of drinking water fully comply with the regulatory values, when moving in old pipelines, it is again polluted. Therefore, it is recommended to conduct the analysis in accredited laboratories and ask for help in selecting filters from specialized companies. The quality of drinking and natural water is assessed by a number of chemical, physico-chemical and sanitary-bacteriological indicators, which are determined by the appropriate standards.
analysis.

Results

Based on the results of the analysis, the following issues will be considered::

1. Defined by personality and level contamination water.

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2. Epidemiologic factors identified and toxic ones levels water.
3. Determine the application of a water-appropriate cleaning method and its suitability for a specific one of the following type use cases.
4. Management of water treatment processes and control over the operation of wastewater treatment plants.
5. Performance evaluation sewage treatment plants structures and sewage treatment plants structures.

Careful analysis of water involves determining the equilibrium parameters. Most of them are the detection of trace elements and toxins for living organisms. These substances include lead, mercury, arsenic, fluorine, tetraethyl lead, petroleum products, pesticides, and radioactive substances. Daily water quality control determines the following indicators: water turbidity, color, smell and taste, pH, temperature, ionic composition, hardness, alkalinity, amount of gases, nitrogen compounds, manganese, sulfates, chlorides, silicates, dry matter, oxidation index and bacterial contamination.

Turbidity of water and the number of suspended particles determination. The degree of turbidity of water is determined by comparing the test sample with a standard solution. The standard solution is prepared by adding a suspension of to distilled water. The turbidity index is measured in mg / l.

The color of water depends mainly on the humic substances they contain and the trivalent iron compounds. Humic substances are formed during the decay of plants, and as a result of their dissolution in water, the water turns yellow. Humic compounds are humic acids (52-58% carbon, 3.3-4.8% hydrogen, 34-39% oxygen).) and filvoxic acids (45-48% carbon,6 % of hydrogen, 43-48% oxygen).

The color of water is measured in degrees. The color index is determined by comparing a sample of water with a standard solution. The standard solution is prepared from a mixture of platinum potassium chloride $PtCl_6$and cobalt chloride salts CoCl2. The color of water corresponding to the color of a standard solution containing 0.1 mg of platinum in 1 ml of water is estimated at 1 degree of color.

The color of drinking water should not exceed 20 degrees.

Turbidity of river water is higher than that of ground water. The amount of turbidity depends on suspended particles in these waters, i.e. mud, sand, plankton, and plant debris. The turbidity of river water can be several thousand mg per 1 liter of water.

The turbidity of drinking water should not exceed 2 mg/l. The amount of insoluble and colloidal particles in water can be determined by the clarity index. Clarity is measured in glass cylinders 30-50 cm high. In this case, the height of the water layer (in cm) when the text is written in a certain font is called the clarity

The filtration method is used to detect suspended particles in water. In this case, the water is filtered and the filter is dried at 105C. The difference in filter weight measured before and after filtration indicates the amount of suspended particles in the water. In practice, it is possible to quickly determine the number of insoluble particles in water by building a relationship between the clarity index and the number of suspended particles.

Odor and taste are included in the organoleptic characteristics of water. The smell of natural water depends on the aromatic substances in it. Water containing inorganic substances has the smell of hydrogen sulfide. The smell of water affects some organisms, for example; it can be associated with magnates and actiomycetes. When water is treated with chlorine, the water smells like chlorophenols.

The smell of water is evaluated on a five-point scale or on a "border check", i.e. the degree of dilution until the smell disappears. The temperature must also be specified. The smell of drinking water should not exceed 3-4 points.

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The taste of water depends on the substances that are naturally present in the composition or as a result of wastewater contamination. In the organoleptic analysis, only the taste of drinking water is checked. The taste of water is expressed as salty, sweet, bitter, sour. In addition, the water may have alkaline, metallic, and other flavors. To determine the taste of water, take a sample of 10-15 ml of water in your mouth for a few minutes and then spit it out. The temperature is also indicated in the analysis. Often, drinking water has no taste at all. The taste of ground water can be salty or bitter, depending on the amount of salts it contains. The pH of domestic and drinking water should be 6.5-9.5. The pH of natural water sources is stored in this range.

The temperature of natural waters can vary from 0o to 25oC. The water temperature is measured using a thermometer during sampling. The temperature of drinking water should be about 7-15oC.

Conclusion

The essential role of pretreatment of water aimed at removing algae and oxidizing organic pollutants before subsequent coagulation and flocculation of water is shown. It is proposed to improve the technological schemes of low-power drinking water treatment depending on the range of concentrations of pollutants, as well as to determine their effective field of application.

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