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Modern Water Supply And Sewage Systems Supply Clean Drinking Water To Consumers

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Abstract: Modern water supply and sewage systems consist of complex engineering structures and devices that serve to provide consumers with clean drinking water, as well as to collect, transfer and treat wastewater. The introduction of centralized water supply and sewerage systems will create great opportunities for gradually improving the ecological situation in our republic, improving the well-being and cultural development of the current and future generations.
Key words: Modern, water supply, sewerage systems, consumers, clean drinking, water supply.

Relevance of the topic. It is appropriate to use groundwater as a water source in the design of water supply systems of settlements, because the quality indicators of groundwater in most cases meet the requirements of the state standard for drinking water (DaST 950:2000). But in recent times, as a result of complex development of dry desert regions, chemical treatment of crops and rapid growth of industry, the level of pollution of natural water sources is constantly increasing. But despite this, in most settlements, the population continues to be supplied with water, the quality of which differs significantly from the requirements of the state standard for drinking water (DaST 950:2000).

Therefore, improving the level of water supply due to the use of effective and advanced water treatment technologies in the water supply system of settlements is considered the most urgent topic in the field of water supply today.

Methods of calculating devices.

During the analysis and study of the process of electrochemical treatment of turbid waters, it was found that the process of electrocoagulation of water is carried out in an electrocoagulator with a plate-melting metal electrode, and the next stage of mixing the coagulated water in a special chamber is considered effective and efficient.

Electrocoagulator device. In water treatment technology, the following methods are used to calculate the installation of a plate electrocoagulator:

1. According to the time of water between the electrodes:

In this case, the full volume of the electrocoagulator chamber is calculated depending on the amount of water Q and the most effective water time t1 among the electrodes determined as a result of experimental research.

$$V = K_{uc} \cdot Q \cdot t_1$$

here, - the coefficient of use of the size of the electrocoagulator.

Then the geometric dimensions of the electrocoagulator are given and the total number of electrode plates is found as follows:

$$n = \frac{h}{l_1 + \delta_1}$$

here, h is the useful height of the electrocoagulator;

- accepted distance between electrodes;
- thickness of electrodes.

The active surface of the electrodes is found as follows

$$S_a = \frac{Qt_1}{l_1}$$

The required value of electric current is found as follows:

$$I = qQ$$

here, q is the experimentally determined relative amount of electric current. Then, the voltage drop U is found from the characteristic of the voltmeter being cleaned. Energy equipment is selected according to the found DC power I and voltage U.

2. According to the relative amount of electric current for the unit amount of purified water q and the current density in the electrodes:

- the active surface of the electrodes (anode or cathode) is determined; $S_a = \frac{qQ}{\sigma}$

here, q is the electrical energy consumption determined by experiment depending on the category of natural water;

- the current density set based on the results of the experiment on the electrodes of the electrocoagulator.

- the surface of a single-plate electrode is given, and based on this, the number of plates in the block of electrodes and the size of the electrocoagulation chamber are found;

- the total voltage is found from the voltmeter characteristic built according to the water being purified and the electrode material;

- energy equipment is selected.

3. According to the dose of chemical coagulant:

-electrode metal dose is determined:

$$m_M = m_K \cdot K$$

where, K is the transition coefficient representing the content of chemical coagulant active (K = 0.157 for aluminum sulfate; K = 0.519 for iron chloride).

- the required current to maintain the required speed of melting of the metal electrode is found;

$$I = \frac{m_M Q}{K_Э}$$

where, - electrochemical equivalent (for aluminum = 0.336 g/A.hour, for divalent iron $K_Э$ =

1,042 g/A.soat

- the voltage drop between the electrodes is determined based on the accepted distance between the electrodes and the proposed current density;

- the geometric dimensions of the electrocoagulator are calculated based on the duration of the most effective water treatment.

4. According to the active surface of aluminum electrodes:

- depending on the type of water being purified, the optimal value of the current density, the voltage U between the electrode plates and the active surface of the anode plates (the ratio of the electrode surface to the unit water consumption) are determined by experiment;

- common surface of anode plates is found;

$$S_a = S_{уд} Q$$

- the required current to maintain the required speed of melting of the metal electrode is found;

$$I = \sigma \cdot S_a$$

- the geometric dimensions of the electrocoagulator and energy equipment are taken into account.

Water mixing and foaming device. In water preparation technology, the following methods are used to calculate the hydraulic type device for water mixing and fluff formation. In hydraulic-type chambers, the mixing process is carried out due to the energy of the water entering the chamber, and the velocity gradient is determined as follows:

for cameras with –color

$$G = \left[\frac{(n \cdot V_1^2 + (n-1)V_2^2)Q\rho}{2 \cdot W_K \cdot \eta} \right] ;\ c^{-1}$$

- for circulating water and whirlpool chambers

$$G = \left(\frac{\rho \cdot V^2 \cdot Q}{2 \cdot W_K \cdot \eta} \right)^{0,5} ;\ c^{-1}$$

Suggestions and comments on the electrochemical treatment of turbid waters

As a result of a brief analysis of the water content of the Sangzor water basin and the Sangzor river, it became clear that the composition of the river water contains a small amount of natural factors, a large amount of anthropogenic influence related to production, communal-household and collector-drainage wastewater. secret shows. The average turbidity of river water is 194.1-582.2mg/l. However, it increases to a maximum of 4,600 mg/l during floods, and therefore it is appropriate to include a preliminary water treatment facility in the design of the technological water treatment system.

During the electrochemical treatment of natural waters, complex electrochemical and physicochemical processes take place when a liquid is exposed to a constant electric field: electrolysis, electrocoagulation, electroflotation, electrophoresis, oxidation-reduction with electrodes, and hakoza. In certain conditions, some of these processes are considered the main ones.

According to the theory of electrochemical corrosion, when an electric current passes, the metal anode turns into a liquid in the form of ions, and then the hydrolysis of the metal ion is observed. Formed metal hydroxide foams have active sorption properties. As a result, the interaction of metal hydroxide and pollutants in the liquid is observed. The resulting fluffy compound can float to the surface of the water (flotation) or sink (clarifier) in the next facility.

It is appropriate to use iron (pulat) or aluminum (duralumin) as an anode for water purification by electrocoagulation. Because these metals are relatively cheap compared to other metals, the range of formation of metal hydroxide with good sorption properties is quite wide.

One of the most important conditions for the treatment of turbid waters by electrocoagulation is the creation of optimal hydrodynamic conditions that ensure the mixing of coagulant with water and the process of fluff formation. The hydrodynamic regime is the main factor determining the size and density of the coagulated particles that are ready to settle, the rate of their joining together or disintegration.

As a result of the analysis of scientific and technical literature, it became clear that there is no specific proposal and considerations for choosing the value of Kemp's criterion depending on the quality of the purified water, the type of reagent used and the method of accelerating the coagulation process. Therefore, it is appropriate to determine these parameters by conducting an experiment based on local conditions, just like the coagulant dose. In this case, Kemp's criteria for the precise design of the mixing and fluffing chamber are first determined, and then the chamber dimensions and the technological image of the process are selected according to the determined criterion value.

Metal consumption in electrochemical water treatment is one of the main economic indicators. The electrocoagulator is mainly made of aluminum or iron plate electrodes. Due to the scarcity and high cost of these materials, when using them as an electrochemical coagulant, an attempt is made to reduce metal consumption as much as possible. In addition, the use of electrocoagulation in each specific situation must be strictly justified, otherwise it may lead to the consumption of a large amount of metal and electrical energy and may not give the expected result. Therefore, the effect of the physico-chemical parameters of the initially purified water, the geometric dimensions of the device, and the electrical and hydrodynamic factors of the treatment on the concentration of dissolved metals, the consumption of electricity, and the effectiveness of the treatment should be determined through experiments based on local conditions.

When the current density in aluminum electrodes is increased to 35 A/m2 during electrochemical water purification, the value increases almost proportionally to the current density in the case of t = 0.5 min. In this interval, the actual value of dissolved aluminum will be higher compared to its theoretically calculated amount. When the current density is further increased, the aluminum melting process slows down and the value decreases compared to the theory.

The amount of dissolved aluminum increases as a result of the extension of the duration of electric water treatment. But at large values of the duration of electrical processing, this relationship is preserved only when the current density is up to 25 A/m2 and t =1min and up to =14 A/m2 and t =1min. The concentration of suspended particles in deionized water decreases with increasing current density in all modes of electrical treatment. But it should also be noted that at the same value of the current density, the level of water purification increases with the increase in the duration of electrical treatment.

In the electrochemical treatment of water, the coagulation process is affected by the amount of electricity passing through the water, but the current density does not significantly affect it. But when calculating the electrocoagulator, it is necessary to take into account the current density, because the amount of dissolved aluminum depends on this parameter.

In the case of electrochemical water purification, the duration of mixing coagulated water has a great impact on the level of water purification. An increase in the duration of water mixing in the inner chamber compared to the outer chamber does not have a significant effect, and in some cases, an increase in the concentration of suspended particles in the purified water was observed.

The longer the water stays in the outer chamber, the higher the level of water purification. This relationship is especially evident in the treatment of less turbid waters. In the treatment of waters with an initial turbidity higher than 400mg/l, the level of water purification changes little when the duration of mixing is further increased.

Using a mixing and foaming chamber (KPiX) in the technological image of water purification by electrocoagulation can increase the level of water purification by 10-15% and at the same time reduce the time of water softening in the water softener up to 3 times;

When calculating KPiX, depending on the turbidity of the treated water and the added metal dose, it is appropriate to take the duration of mixing in the inner chamber in the range of 0.8-2.0 minutes, and in the outer chamber - in the range of 2.0-5.0 minutes.

Conclusions

Hydrocarbon ions are high in the upper reaches of the river, and sulfate ions make up the main part of the composition in the lower reaches. The analysis of scientific and technical literature and developments shows that the scope of using the electrocoagulation method in natural water purification is increasing year by year and is much more effective than other methods. The advantage of this method over chemical coagulation is the absence of reagents, ease of organization of the device, and the possibility of automating the electrochemical process. In addition, the harmful and toxic substances in the water being purified by this method are oxidized, the hardness of the water decreases and it is neutralized.

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