MEMBRANE PROCESSES FOR WATER AND WASTEWATER TREATMENT

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Nowadays, the problem of salinization of water is very common in Ukraine due to natural and anthropogenic factors, and industrial regions suffer the most. The high level of mineralization is occurred due to the presence of coal, iron ore and uranium mines. Great contribution to the salinity of water objects is made by the discharge of mine water, saline wastewater, water from cooling systems and brine infiltration of many slime storages. Unfortunately, modern methods of saline water treatment do not solve the problem, but only aggravate the situation in densely populated areas with well-developed industry [1-3].

The solution to this problem is the introduction of innovative complex water desalination technologies at the utilities and industrial enterprises. It will helps to use water that has an increased mineralization, which will ensure a significant reduction of discharges of mineralized sewage and will lead to improvement of the quality of groundwater.

Membrane technologies have high efficiency and can be used at different stages of water treatment, as well as together with other methods of purification. In regions with a lack of fresh water, membrane technologies are widely used to desalinate highly mineralized waters.

Depending on the quality of the water and the requirements for the treated water, only membrane separation methods can be used for water treatment and wastewater treatment in a technologically grounded combination [1-3].

In this work, water desalination was studied using cartridges with low-pressure reverse osmosis membrane Filmtec TW30-1812-50. The model solution was used through experiments (hardness – 9.0 mg-eqv/dm^3, alkalinity – 5.0 mg-eqv/dm^3, SO_4^{2-} – 13.0 mg-eqv/dm^3, Cl- – 3.5 mg-eqv/dm^3, pH = 8.9). The membrane Filmtec TW-30-1812-50 provides en effective water desalting at pressures up to 1 MPa (in this case, P = 0.3 MPa) with high process efficiency.

When desalting the model solution, the highest residual concentrations of chlorides were fixed in the permeate. The residual concentrations of sulfates and hardness ions were rather low. The content of ions in concentrates was determined by their initial concentration and the effectiveness of detention on the membrane.

In concentrates, the increase in concentrations of all cations and anions that were controlled in this process were observed. The highest concentrations correspond to hardness ions and to sulfates.

Since the efficiency of water purification from any ions depends not only on the residual concentrations of ions, but also on their initial concentration, then the efficiency of the water purification process from any ions is better to evaluate by the values of the membrane selectivity.

During filtering, the Filmtec TW30-1812-50 membrane was characterized by the lowest selectivity of 89-95 % in relation to chlorides; the selectivity towards sulfates and ions of hardness reached the values 98.8- 99.7 %.

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