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STUDY OF GROUNDWATER POTABILIZATION TECHNOLOGIES IN DYNAMIC CONDITIONS

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Introduction

Water is the basis of the existence of the biosphere, an indispensable environmental factor for life on earth. Globally, less than 1% of the planet's aquatic resources are available for human consumption, about 1.2 billion people do not have access to safe drinking water. The Water and Health Protocol, to which the Republic of Moldova has also acceded, includes priorities of the policies submitted at national level regarding the need to ensure the access of the population to safe sources of drinking water. At the same time, the quality of drinking water in the Republic of Moldova is constantly low. The results of water quality monitoring studies show that the worst situation is in rural areas, where the main source of water is wells. The highest share of water with unsatisfactory quality is characteristic for groundwater which feeds over two thirds of the population of the republic. According to the analyzes, about 61% of the aqueducts related to the underground water sources and about 84% of the water from the wells do not correspond to the sanitary norms according to the chemical composition. This paper presents the results of the study of groundwater quality in Panasesti commune, Straseni district, Republic of Moldova, and chemical indices of water quality after treatment using various potabilization processes.

Materials and methods

The following technological processes were used: aeration, oxidation, adsorption on activated carbon and ion exchange. The activated carbon (AC) used was obtained from apple wood by physical-chemical activation with water vapor. Purolite A-400 anionite was used as an anion exchanger, and Purolite C-100E cationite was used as a cation exchanger. Oxidation of the pollutants was performed by dosing sodium hypochlorite. The technological scheme used for groundwater potabilization is presented in Figure 1.

Results and conclusions

The evaluation of the obtained results on the chemical indices of the initial water quality allow us to conclude that the value of sulfur concentration in water is 8 times higher than the maximum allowable concentration for drinking water, of sodium ions - 2.5 times higher, of ammonium and ammonia ions - 10 times higher, of oxidability - twice higher, and fluoride ions - 2.6 times higher than the maximum allowable concentration for drinking water.

In order to eliminate the slightly volatile substances, the aeration process was used, concomitantly with water disinfection by adding sodium hypochlorite solution (4%). These procedures allowed to reduce the content of sulfides and ammonium ions below the maximum permissible concentration (MPC) limits. Also, the oxidation process allowed the partial discoloration of the water by the decomposition of organic substances, so the water became slightly yellowish, and the smell of hydrogen sulfide and ammonia disappeared.

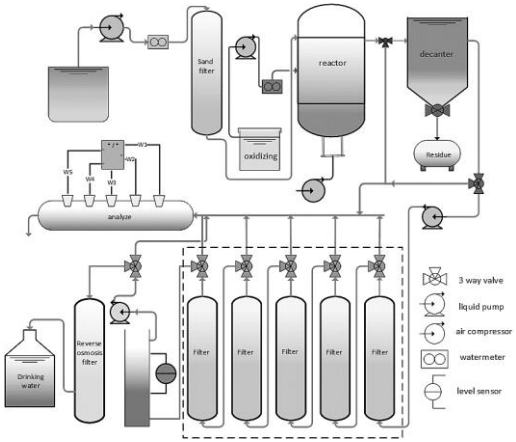

Fig. 1. Diagram of the installation used for dynamic testing of water potabilization procedures

The next tested procedure was ion exchange on cationite and anionite. The obtained results indicated that for the analyzed water this process is not necessarily due to the low content of calcium and magnesium ions, and fluoride ions cannot be removed by ion exchange. The use of ion exchangers led to an increase in the concentration of sodium ions, which were in excess in the initial water.

The method of adsorption on activated carbon demonstrated satisfactory results: the value of chemical oxygen demand (COD) decreased below the MPC, and the color and odor disappeared completely.

Testing results allow to suggest the right technology for potabilization of the water from the well of the factory in Panasesti commune, which should include the following processes: mechanical filtration through sand filter, aeration and oxidation with sodium hypochlorite, adsorption on activated carbons and the process of reverse osmosis to remove excess sodium and fluoride ions.

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