TECHNOLOGY METHODS OF PURIFICATION OF ARTESIAN WATERS ULTRAFILTRATION AND REVERSE OSMOSIS

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Abstract. *Reverse osmotic water purification and ultrafiltration are methods of removing foreign impurities, heavy metal salts and organic inclusions from the liquid. The technology is based on the process of membrane separation by means of a semi–permeable membrane through which water passes under high pressure. Ultrafiltration, osmosis – methods of purification of artesian waters and waters from surface sources, which are based on the passage of liquid through a semi-permeable membrane under pressure.*

Keywords: *ultrafiltration, membrane, reverse osmosis, water.*

The purpose of the filter elements is also different, since ultrafiltration units are used to remove suspensions and macromolecules from water. Such cleaning reduces the turbidity and color of the liquid, detains colloidal particles. It is intended for preliminary preparation and de-ironing of water. The fundamental difference between the two cleaning methods is the pore size of the filter membrane: reverse osmotic membranes retain microparticles with a diameter from 0.0001 to 0.001 microns, and the pore size of the ultrafiltration membrane element is from 0.01 to 0.1 microns. The pressure created during osmotic cleaning is also significantly higher – at least three times. Reverse osmotic systems pump a pressure of at least 0.3 MPa, and ultrafiltration systems – from 0.1 MPa.

Reverse osmosis is effective in removing most particles with sizes exceeding 0.001 – 0.0001 microns from water. Among them are hardness salts, sodium ions, sulfates, nitrates, iron, dyes, heavy metals and many trace elements. Due to the small pore diameter, the semipermeable membrane also detains bacteria and viruses, including infectious agents of hepatitis and cholera. However, reverse osmotic membranes are highly sensitive to contamination and quickly become clogged when working with water that has not been pre-prepared.

The differences between ultrafiltration and reverse osmosis are due to the characteristics of the membranes used in the water purification process. The first are made in the form of modules with thousands of capillaries, the inner diameter of which is from 0.7 to 1 mm. They are made from the following materials:

polyestersulfone;
polyamide;
polyvinylidene fluoride;
aliphatic polyamides;
polyacrylonitrile;
cellulose derivatives, etc.

Hydrophilic materials with high resistance to layering of organic sediments are used for production. Depending on the diameter of the capillaries, the filtration area of the membrane module is 30-70 sq. m. The peculiarity of cleaning is the movement of the water flow from the inside out: the liquid being cleaned passes through the internal capillaries, and the filtrate seeps out through the walls. But the reverse direction of the water supply is also acceptable.

Membranes for ultrafiltration units contribute to the removal of suspended particles that settle on the surface of the capillaries. The small diameter of the pores contributes to the effective removal of colloidal silicon, organic substances, iron. Their particles form a sedimentary layer on the surface of the membrane, and to remove it, backwashing is necessary – water supply in the direction from the outside to the inside.

The membrane elements are divided into two types, taking into account the structural design:

hollow fiber – in the form of tubes with a diameter of about 1 mm with porous walls through which the liquid flow passes;

spiral-wound (rolled) – in the form of a tube with holes for permeate passage, around which a drainage sheet, a mesh separator and sheet membranes are wrapped.

During the production of roll filter elements, the pressure cavity and the collection cavity of the contaminated solution are separated. To do this, when twisting the membrane package, the edges are treated with a harmless waterproof glue.

Ultrafiltration, osmosis – methods of purification of artesian waters and waters from surface sources, which are based on the passage of liquid through a semi-permeable membrane under pressure. The differences between the technologies are in the structure and structure of the membranes, the diameter of the pores, selectivity (the ability to separate certain components of the solution).

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