

REMOVAL OF HARDNESS IN WASTEWATER EFFLUENT USING MEMBRANE FILTRATION

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Abstract

The effluents from urban wastewater treatment plant are characterized by high concentrations of both calcium and magnesium salts which contribute to the hardness of this particular water flux. It applies primarily to places where the distribution systems draw water from underground sources. Using hard water, for instance, in households causes the domestic wastewater to be hard as well. The hardness of wastewater is not a normative indicator. However, it is an important scientific aspect in the field of water reclamation. As part of this work, research of the reduction of the overall hardness of effluent from the selected urban wastewater treatment plant in the Upper Silesia (Poland) was commenced. After the preliminary tests it was determined that, according to the common water hardness classification, the hardness of effluent from the researched treatment plant equals the hardness of hard water (350–550 mg CaCO₃/L). In order to reduce the hardness of wastewater effluent a membrane filtration, including nanofiltration and reverse osmosis, was proposed. The processes were performed comparatively with the use of composite pipe membranes of PCI Membrane System Inc. (USA). The membrane used for nanofiltration was AFC-30 and the one for reverse osmosis was AFC-80. In both cases the transmembrane pressure was 2.0 MPa, while temperature and feed linear velocity amounted to 20°C and 3.4 m/s, respectively. It was determined that after both the reverse osmosis and nanofiltration the treated wastewaters were very soft. Therefore, the use of these processes, for instance, for productive purposes, may be considered. It should also be borne in mind that the nanofiltration process was more favorable in terms of membrane effectiveness.

Keywords: Effluent from wastewater treatment plant, Hardness of wastewater, Membrane filtration.