



Prevention of scaling during the desalination of geothermal water by means of nanofiltration

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ABSTRACT

Geothermal water which is discharged into surface waters following use has a negative impact on the water biocenosis. For this reason, the desalination of geothermal waters using membranes can not only be considered as a means of providing water for irrigation purposes, but also as a possible source of drinking water supply. Geothermal water has a high content of divalent ions, and in such conditions scale is formed on the membrane. Scaling causes a decrease in membrane capacity and permeate quality. The use of the reverse osmosis process in water desalination often requires careful selection of the pre-treatment methods. One of them is nanofiltration which almost completely removes multivalent salts, whereas only 10–50% of single-valent metal salts are removed. The objective of the studies was to develop a two-stage membrane desalination (NF + RO) process for geothermal water that has a high degree of hardness. In the experiments carried out, two different geothermal waters were tested, one from the Podhale basin (southern Poland) and the second from Uniejow (central Poland). Commercial membranes from the Dow-Filmtec company were used in the NF and RO test. The desalination efficiency (flux and permeate composition) and scaling prognosis were determined. Based on the results, an innovative approach to the role of membrane processes in the desalination of very hard geothermal water is proposed. It was concluded, that for water of high hardness (Uniejow) there should be applied a more compact nanofiltration membrane (NF90) before reverse osmosis, due to this method, it was achieved close to 100% removal of most analyzed ions. In the case of water with a lower hardness (Banska) there should be applied a less compact nanofiltration membrane (NF-270) before reverse osmosis obtaining by this method similar results of ions removal as in the case of NF-90 membrane, at the level close to 100% with a higher permeate flux.

Keywords: Geothermal water; Desalination; Integrated system; Nanofiltration; Reverse osmosis

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