Abstract

Currently, the problems related to the development of seepage are emerging more and more frequently. For this reason, there is a constant need to improve the existing methods, and to develop new ones, for determining the direction and intensity of the development of seepage processes occurring in earth-fill dams and their foundations. The analysed earth-fill dam is located in Pieczyska in the Kujawy-Pomerania province at 49.115 km from the river mouth of the Brda River. The catchment area is 4.109 km². The article aims to verify the non-invasive, non-subjective method for examining the direction of seepage through earth-fill dams using the modified scalar product approach, which allows to determine the direction and intensity of the seepage process. A proper analysis of this process can greatly reduce the repair costs (injections or other methods of sealing), and significantly increase the safety of the existing earth-fill dams. In the case of the dam in Pieczyska, in 2010–2015, the two piezometers (located on the left abutment of the dam and denoted as P15A and P60) exhibited a direct hydraulic connection with the upstream water level (the scalar product approach). For the study dam, the “source” piezometer (to which all the piezometers in its surrounding exhibited similar changes in water levels) turned out to be the piezometer P15A. This fact was confirmed both by the number of connections between the individual piezometers and the resulting system of equipotential lines for the dam.

Key words: earth-fill dams, monitoring, piezometers, safety of hydraulic structures, scalar product