

## Fibre optic leakage detection system – Derince Dam, Turkey

An early detection and exact localisation of leakage is important for a reliable and a safe monitoring of structures. Modern fibre optic temperature measurement methods enable this monitoring along conventional fibre optic cables. The glass fibres can be integrated during the construction of a new dam and the temperatures inside the building can be measured.



Upstream concrete face sealing of Derince Dam

During the construction of the Derince Dam in Turkey, a fibre optic leakage monitoring system was installed on the upstream side. Roughly 550 m of hybrid fibre optic cable was used along the perimeter of the dam and underneath the copper water stop of the joint to the plinth and the abutments. The aim is to detect possible seepage water through the boundary joint and at the plinth of the dam as early as possible.



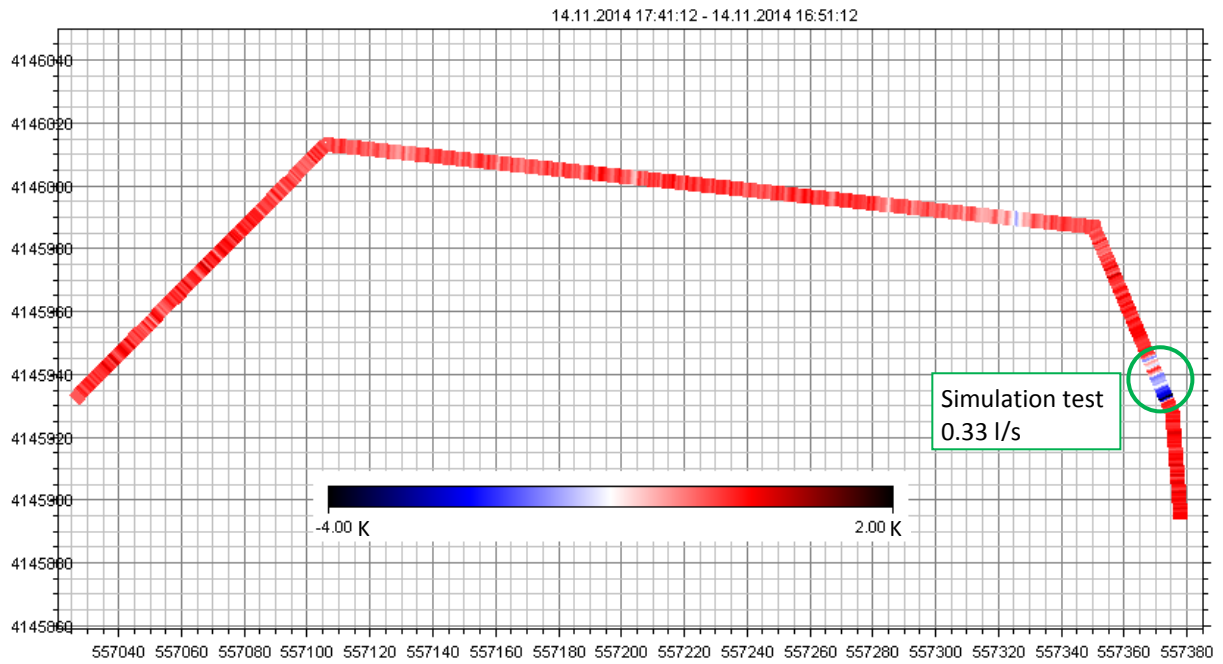
Fibre optic cable along the perimeter of the dam



Copper water stop

The installed hybrid fibre optic cable consists of two components: an optical fibre that functions as a temperature sensor and copper wires used for heating. The Heat-Pulse-Method allows the determination of the temperature increase and the thermal conductivity. Thus, leakage can be determined with a spatial accuracy of  $\pm 0.5$  m.

Two leakage simulation tests (flow rates 0.095 l/s and 0.33 l/s) were performed in order to check the functionality of the monitoring system. The figure shows the result of the measurements during the simulation test. It can be clearly seen that the system reacts to water infiltration and the monitoring system is fully functional.



Temperature change along the fibre optic cable during the leakage simulation test (green circle)