Fibre optic leakage detection system – Villalba de los Barros Dam, Spain

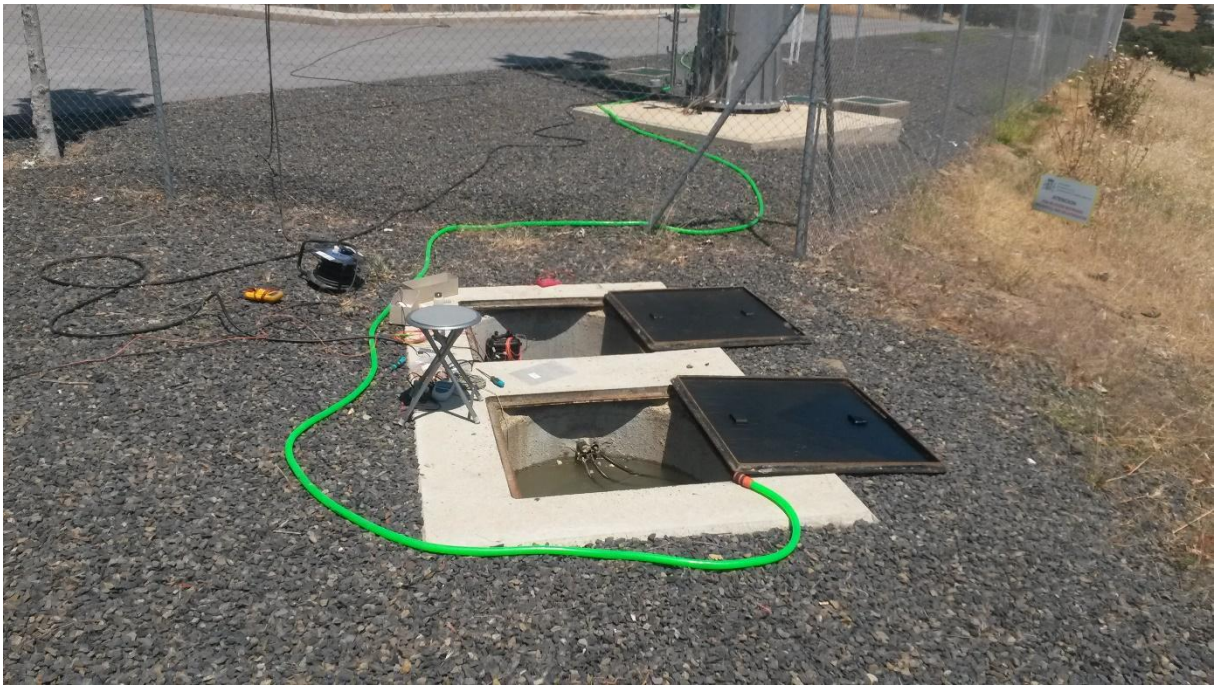
The monitoring of dams and embankments is essential for the detection and the localisation of leakage in the sealing at an early stage. Temperature measurements using fibre optic cables are used in order to detect leakage at an early stage and thus prevent expensive consequential damage. In case of a new construction of a dam the direct integration of a fibre optic cable is advisable. Then, temperatures can be measured within the structure.

Villalba de los Barros Dam, Spain

At the Villalba de los Barros dam in Spain, a fibre optic leakage detection system was installed during the construction. The dam is located 15 km south of the town of Almendralejo and serves as both, as water reservoir and as flood protection. The earth fill dam consists of a clay core that is protected by a 2.8 m wide filter. The leakage detection system was installed in order to control the intactness of the sealing core. Therefore, standard outdoor cables were installed that serve as temperature sensors and can be used for the Heat-Pulse method. Cables were installed within three independent measuring sections:
1) In a trench at the downstream D/S interface between the filling concrete on the gallery and the core,
2) At the interface between the filter and the drainage layer at a height of 292.3m,
3) In the filter layer at 313.8 m.

The fibre optic leakage detection system was installed in order to evaluate changes in the leakage conditions in the dam due to reservoir impoundment and during dam operation. A reference measurement was carried out before the impoundment of the reservoir, which showed no temperature anomaly indicating seepage. This reference measurement is used for the comparison with other control measurements.

In addition, a leakage simulation test was carried out in order to check the functionality of the system. A certain area of the cable was submerged. The temperatures were measured before and during the heating phase. Thus, the temperature difference and the thermal conductivity could be determined. The area with the submerged cable could be clearly identified during the data evaluation.



Leakage simulation test

The simulation test confirmed the functionality of the fibre optic leakage detection system. This ensures an error-free inspection of the seal core.