Fibre optic leakage detection – Winscar Dam, United Kingdom

The early detection and the exact localisation of leakage in dams are important for the identification of early internal erosion. Thus, serious damage of earth dams can be prevented. Temperature measurements with fibre optic cables help to early detect leakage in good time and to prevent consequential damage.

Winscar Dam

The Winscar Dam is one of the UK's largest earth dams and has a capacity of 8 million m^3 of water. Built between 1972 and 1975, the dam was sealed with 120 mm thick asphalt concrete in two layers 120 mm thick.

For a new sealing of the dam, a PVC geomembrane of the Italian manufacturer CARPI with a thickness of 2.5 mm and an underlying geotextile membrane was used. It protects the PVC Geomembrane from damage and does not inhibit drainage. Along the dam 25.000 m^2 of material was installed.

For the fibre-optic leakage monitoring system, 10 km of fibre-optic cables were installed either parallel to the vertical profile of the geomembrane or horizontally between the profiles at the dam foot. The dam was divided into five investigation areas with respectively about 2000 m of fibre optic cable.

The localisation of leakage is based on the Heat-Pulse-Method and allows the supervision of the sealing system at the upstream side of the dam. A hybrid cable consisting of two components was installed for this purpose. The cable consists of glass fibres for temperature measurements and of copper wires that can be heated by a short-circuit current. Thus, the temperature increase can be monitored and the thermal conductivity can be measured, allowing for a pinpointed detection of possible leaks.