

Dam Leakage Detection and Monitoring

Knezevo Dam, Macedonia

A rockfill dam with an asphalt core in Macedonia required leakage detection and seepage monitoring. AP Sensing provided a monitoring solution using our partner GTC Kappelmeyer's fiber optic leakage detection method alongside an AP Sensing Distributed Temperature Sensing (DTS) device.

In order to solve water-supply problems in six municipalities in eastern Macedonia, a major dam project was commissioned: the Knezevo dam. The rockfill dam is 75 m high and 300 m wide at the base. Its storage facility is 4 km long and it has a maximum accumulation of 23.5 million m³ of water.



Knezevo Dam: late construction phase

A dam of this size and importance needs to be monitored for leakage. The following diagram shows the most efficient pattern to use for the sensor cable layout. The cable was installed on the downstream side of the interior asphalt core, inside the filter zone.

Approximately 1,200 m of sensor cable was required. The type of cable selected was a hybrid sensor cable which utilizes multimode sensor fibers together with copper wires in the tube to facilitate controlled heating and cooling. In this case, the copper wires have about 11 W/M heat output and four heating cycles are carried out daily.

* The GTC Kappelmeyer Fiber Optic Leakage method was developed as a highly effective and sensitive tool to monitor seepage. Employing fiber optic sensing technology, absolute temperature changes within the body of the dam caused by seepage water are detected.

In addition, a heat-pulse method can be used to detect temperature differences. The copper wires in the hybrid cable are used to heat the sensor fiber, making it possible to identify zones with increased heat transport (an indication of seepage). Temperature differences between the start and the peak of the heat pulse cycles can visibly reveal seepage.

It is also possible to monitor the effective thermal conductivity along the cable itself. Like the heat-pulse method, the monitored information reveals zones with increased heat transport.

When used in combination, these methods reveal seepages and changes in ground saturation levels with great sensitivity.



Knezevo Dam Overview