THE BEST WAY TO MONITOR SOIL MOVEMENT, SEAPEAGE OR TO DETECT THE PRECISE LOCATION OF LEAKAGE IS A DISTRIBUTED FIBER OPTIC SOLUTION.

Monitoring plays an important role in every stage of a mine exploration and operation. It is used to accurately assess geological conditions and quantify certain parameters over time as well as monitoring their rate of change. Also Monitoring increases level of understanding to optimise the decision making process and understand the onset/evolution of the damage/deformation.

Monitoring is used to accurately evaluate:
- Geological conditions as the excavation progresses in ore extraction tunnels
- Integrity of tailing dams during their operation
- Integrity of mining products pipelines
- Soil settlement and subsidence monitoring
- Early warnings of sinkhole formation
- Boreholes and drillholes ground deformation monitoring.

References

- Noumea Mine - New Caledonia, 2015
- Block caving in gold mine - Australia, 2015
- Rio Tinto Resolution Copper Mine shaft borehole monitoring—USA, 2019
- Anglo American Motoloto Mine Mareesburg tailing dam integrity monitoring—South Africa, 2017
- Cadia East Underground Project –Ore extraction tunnel deformation monitoring - Australia, 2015
- K+S Potash Legacy Project brine water pipeline leak detection—Canada, 2014
- Mosaic Old Brine Well Salt Mine sinkholes formation monitoring—USA, 2010
- Laguna Dam (Rock-filled type) - Chile
- Bioleixivation Valley (Dike type) - Chile
- Bioleaching tailing dam integrity monitoring project - Chile
- Antofagasta Minerals Esperanza 154 km mining products pipeline leak detection - Chile, 2010
- Quadra FNX Mining Sierra Gorda 141 km Cu concentrate pipeline leak detection - Chile, 2013
- EBPEIII FO Bio Lixiviatiion - Chile, 2011
- Laguna Seca - Chile, 2010
- EWE AG 55 km brine water pipeline leak detection - Germany, 2002
Tailing Dam Deformation and Internal Erosion

Seepage through an embankment (earth and tailing dam, dike etc) can induce the movement of soil particles. This phenomenon, known as internal erosion, has been identified as one of the most important causes of failure.

Detecting internal erosion is difficult at an early stage, so Fiber Optic Distributed Sensing is increasingly recommended by the best designers as a key monitoring solution for dam safety management.

Pipeline Integrity Monitoring

The integrity management of pipeline presents challenges that are quite unique. Their long length, high value, high risk and often difficult access conditions, require continuous monitoring and an optimization of maintenance interventions. The main concern for pipeline owners comes from possible leakages that can have a severe impact on the environment and put the pipeline out of service for repair. Leakages can have different causes, including excessive deformations caused by earthquakes, landslides, corrosion, wear, material flaws or even intentional damage.

Leakages can be detected and localized using distributed fiber optic temperature sensors. Fluid pipelines generate a hot spot at the location of the leak. These localized thermal anomalies can be detected by a Distributed Temperature measurement system such as DiTemp, which provides good spatial, time and temperature resolution.

Furthermore, it is often possible to detect damage before a critical state is reached. The SmarTech’s solutions are ideally suited for these tasks. Measuring distributed or localized strain detects the increased stresses caused by external actions such as landslides and earthquakes, or internal causes such as cross-section reduction due to corrosion and wear.

These solutions allow the precise measurement of temperature and/or strain every meter along a fiber optic cable that could be deployed over long distance pipelines.
Ore Extraction Tunnel Deformation Monitoring

Deformation monitoring system is necessary to detect and evaluate mass rock behaviour / actions over tunnels during construction development operations and enhance block-caving operation, as well as to increase safety and production efficiency with better knowledge of the fractured rock mass behaviour. SMARTEC offers monitoring systems able to identify and localize the movements of such structures over long distances.

SOIL SETTLEMENT, SUBSIDENCE & SINKHOLE FORMATION MONITORING

Distributed fiber optic technology offers the capability to measure strain and deformation at thousands of points along a single fiber up to tens of kilometers. This is of particular interest for geotechnical monitoring of sensitive infrastructures, where it allows detection and localization of ground movements, such as slope failure and sinkhole. Fiber optic sensing system offers the ability to detect and localize deformation induced by geotechnical movements, allowing the monitoring of several kilometers with a single instrument and the localization of an event with a precision better than 1 meter. Ground settlements and deformations induce the fiber optic sensor in tension or compression by changing its tensile state. These variations of tensile state can be detected, localized and quantified.

The sensing cable is used to measure strain, elongations and movements within the tunnel liner. The sensor can be embedded in the structure, embedded in concrete during construction, installed into grooves or anchored to the surface in order to retrofit existing tunnels.

Such monitoring system is able to measure deformations over long distances by means of one continuous sensing cable. One of the advantages is that the sensing cable also acts as a connecting cable, and the space occupied by the sensor is therefore negligible with no interferences.

Boreholes, mine shafts and underground drill holes Monitoring

Distributed Fiber Optic sensors are installed inside boreholes, shafts and underground drill holes to measure strain and temperature and to monitor ground deformation during mining.

www.roctest.com
Roctest is featuring a complete line of conventional sensor-based solutions ranging from the ultra-robust traditional vibrating wire technology to state-of-the-art fiber-optic technology used for the measurement and monitoring of geotechnical projects and structural health monitoring (SHM) of critical assets such as: dams, tunnels, mines, buildings, bridges, nuclear power plants and many other structures too numerous to list.

Roctest offers a wide range of pressuremeters, rock dilatometers, lab and in-situ testing equipment for soil and rock.

Services, Maintenance & Support

Roctest offers a full range of pre and after-sales services such as System Design, Installation, Operation & Maintenance, Data Management and Data Analysis to ensure total peace of mind including on-site service, hotline support, service plans and maintenance.

Our maintenance and support plans provide annual check, performance check, software updates and system maintenance.

Please contact us for more information on the multiples services offered by our skilled multilingual Project Engineers and Support team..

Available Application Notes

- Tailing Dams
- FO Leak Detection for Dams and Dikes
- Dam & Dike Instrumentation and Safety Monitoring
- Tunnel Instrumentation & Structural Health Monitoring
- Bridge Instrumentation & Structural Health Monitoring
- Building Instrumentation & Structural Health Monitoring
- Historical Monument Instrumentation
- Geotechnical and Structural Monitoring
- Nuclear Power Plant Instrumentation
- FO Movement Detection in Tunnels
- FO Leak Detection for Chemical Plants
- FO Leak Detection for Pipelines
- Storage Facility Instrumentation