CASE STUDY
RAILWAY TUNNEL REKAWINKEL

Real Time Structural Health Monitoring of Railway Tunnels

ABOUT OUR CLIENT

Client:
Railway company

Location:
Austria

Industry:
SHM, Transportation

The railway tunnels in question are located on the ÖBB line Vienna – Linz. During their reconstruction in the last century, the vault was reinforced with concrete. Unfortunately, over the last decade, the concrete layer has started to flake as a result of water penetration and poor connection of concrete and sandstone masonry.

As any loosened piece of concrete, which falls on the tracks, can be fatal for the fast passing trains, we were asked to implement the real time displacement monitoring of disturbed areas. Due to the high utilization of the tracks, it was necessary to keep railway operations undisturbed. Therefore, complex reconstruction in the near future was not possible.

▶ Displacement monitoring of disturbed areas in the concrete layer.

▶ Automatic generation of alarms when thresholds are exceeded.

KEY FACTS

Initial state
▸ ashlar masonry tunnels built in 1858
▸ concrete layer flaking as a result of water penetration

Products and technologies used
▸ FBGuard 1550 8CH
▸ Displacement tunnel sensor
▸ FBG temperature sensor

SOLUTION

We have developed the customized FBG displacement sensor, designed to monitor local structural deformations. Its smart transduction mechanism converts the displacement between the concrete layer and sandstone masonry to optical fiber elongation. This fiber optic sensor can, without any limitations, cope with the curved and rough surface of the tunnel and thus it efficiently operates even in harsh environments (e.g. water, EMI, or shock wave).

When there was no traffic on the line, we installed the FBGuard 1550 monitoring system, locating it 2 kilometers away from the last sensor. This 8 channel fiber optic interrogator was connected to the internet and available online for easy remote connection and system supervision.

2	**1**	**22**	**2**	**2**	**2**
railway tunnels	8 channel interrogator	Displacement tunnel sensors	FBG temperature sensors	kilometers distance of last sensor from unit	alarm thresholds set

PROJECT RESULTS

All measured data were automatically streamed to the remote data server containing necessary instruments for subsequent data processing, management and visualization.

Moreover, to ensure safe railway operation, the client's civil engineers defined two alarm threshold levels that should not be exceeded, under any circumstances. When these levels were exceeded, indicating imminent flaking of the lining, the alarms were immediately generated and sent to the client's operational center.

1.
Implementation of the real time SHM system

2.
Automatic alarms in case of imminent flaking of the lining

3.
Development of the customized displacement sensor

PROJECT PARTNERS

nBG

FlexKom INTERNATIONAL

GET IN TOUCH WITH US
and we will recommend the most suitable solution for your project.

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