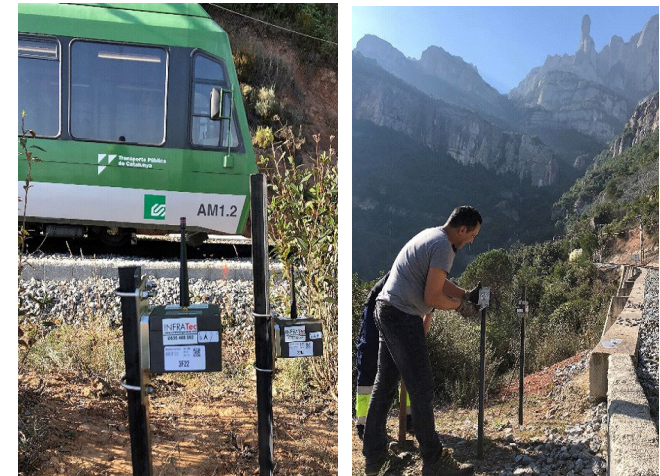


Monitoring of the Montserrat Rack Railway

CLIENTS: FGC / INFRA Tec / INSTOP

How remote condition monitoring installed on three different elements of historic mountain railway is supporting effective maintenance



Challenge

The Montserrat Rack Railway is a 5 km mountain railway line near Catalonia, Spain and is the only transport link to the mountain-top monastery of Montserrat.

The area is subject to large seasonal temperature fluctuations which cause the steel rails of the railway track to undergo movement. In order to gain a better understanding of these movements and to safeguard the railway and ensure passenger safety, a wireless monitoring solution was proposed.

Data was needed on rail temperature and the magnitude of track movement in order to enable analysis of the relationship between temperature and track geometry, and to understand if changes to track geometry posed any significant risks.

Solution

Two areas were selected for monitoring. In each zone, two Senceive PT100 RTD sensor nodes with integrated triaxial tiltmeters were used to monitor the track and rack of the rail. These were chosen due to the ease of combined tilt (resolution of $3.0.0001^\circ$ and repeatability of $3.0.0005^\circ$) and temperature (accuracy of 0.1°C) sensing in a single unit.

Four triaxial tilt sensor nodes were also installed in each zone: two mounted on stakes on the nearby slopes, and two installed on catenary poles adjacent to the track.

As the two monitoring zones were more than 500 m apart, each had its own FlatMesh™ Gateway for data transmission. Data from the six sensors in each zone was transmitted to a cellular communications Gateway and onto Senceive's secure cloud-based server and data management platform - WebMonitor™. The system was configured to send alerts by SMS and email in the event of detected movement levels outside the pre-defined thresholds.

Outcome

The installation was carried out quickly and efficiently without disruption to the rail service. The site continues to be monitored with the sensors and data clearly show the displacement, temperature and inclination of the site which have provided more effective management and maintenance of the railway.

