RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

BACKGROUND
Network Rail’s asset engineers are responsible for maintaining a large number of ageing structures that form part of the UK’s railway infrastructure. Network Rail has traditionally used deflection monitoring of vertical crown displacements at the arch soffit to assess the condition of structures. This approach uses a telescopic pole equipped with a displacement sensor, but proves impractical in many cases where structures overly active highways or watercourses. As a result, a study was commissioned by Network Rail to evaluate the potential monitoring technologies that could be employed on their masonry arch structures.

A 150 year-old single-span masonry arch bridge, was selected for trials. The structure carries two tracks and serves as a main rail artery in the Northern UK. It is used by several hundred passenger trains on a daily basis as well as occasional freight trains.

OBJECTIVE
The bridge shows signs of past damage from its 150-year working life, including spandrel separation cracks, longitudinal cracking to the south-east of the arch barrel, and bulging of the spandrels, parapets and wing walls. Network rail are required to periodically monitor the structure, despite recent works being carried out to stabilise the structure using tie bars, stitching and grouting of cracks. Their asset engineers were keen to explore the range of alternatives available and determine whether these could improve on the conventional displacement monitoring that was being carried out previously.

If successful, the monitoring system developed for this bridge would be adapted to multiple other “at risk” structures which were exhibiting similar defects due to their age.

CHALLENGES
Measurements needed to be taken before/during/after the trains crossed the bridge to determine if the trains caused stress, due to their loads.

A long term reporting solution for how much the cracks were expanding/contracting was also required, along with the overall need for continuous sensor data input (over 100 samples per second, per sensor) on a battery system - AC power was not an option.

SOLUTION
RST provided a combination of instrumentation with data logging for real time alerting as well as dynamic data while the train was crossing.

Crack Meters were installed to monitor the expansion/contraction of the cracks and Strain Gauges were used to determine the stress due to the load of passing trains at different locations.

A solar panel system was configured to provide 100% active data acquisition.
RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.

RAILWAY ARCH BRIDGE MONITORING

UK Network Rail
A CUSTOMER SUCCESS STORY
BY RST INSTRUMENTS LTD.