Better safe than sorry

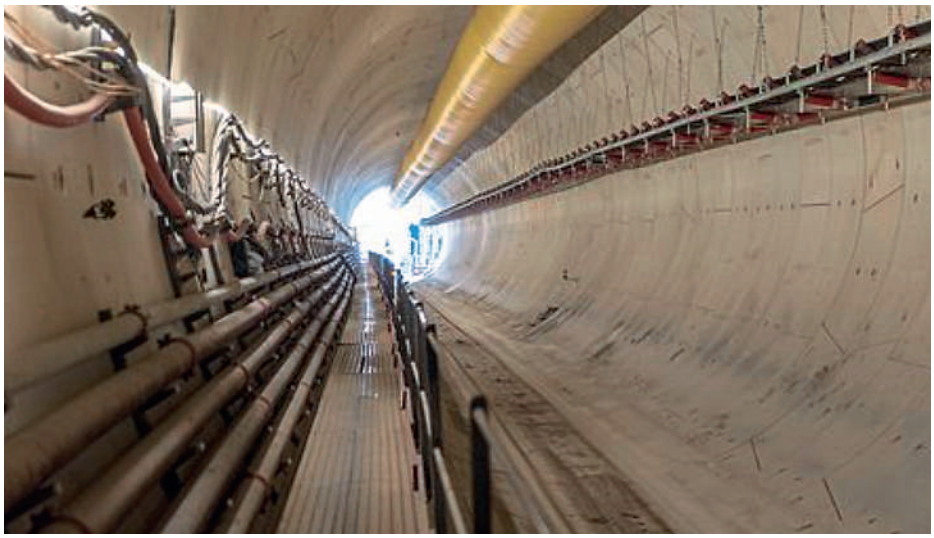
Topcon's **Chris Emery** shares some thoughts on the importance of structural monitoring and how projects on both sides of the English Channel are pointing the way ahead

We're facing a huge demand on our infrastructure assets globally. Climate change, population growth, and an increasingly urbanised global population mean ever greater pressure to build new infrastructure assets as well as develop and maintain existing ones.

There's pressure on our industry to find smarter ways of working, adopting automated technology and efficient work processes to meet this huge infrastructure demand within current funding and skills constraints.

Managing risk

An example of automated technology on a large scale, the €22bn Grand Paris Express is currently one of Europe's most exciting infrastructure rail projects. Cementys is one of the specialist monitoring service providers awarded contracts on the first



Work starts on the Grand Paris Express project at the Puits Champigny Plateau site. Led by Société du Grand Paris (SGP), the project will see the construction of four new automatic metro lines, the expansion of two existing lines, and ensure Parisians and tourists alike can move freely around the city via train. Photo: Société du Grand Paris / Gérard Rollando

Crossrail's Elizabeth line will stretch more than 60 miles from Reading and Heathrow in the west through central tunnels across to Shenfield and Abbey Wood in the east. The new railway will stop at 41 accessible stations, 10 newly built and 30 newly upgraded, and is expected to serve around 200 million people each year. Pictured here, the two machines excavating the longest 8.3km stretch of tunnels successfully break through into Farringdon station in May 2015. Photo: Crossrail Ltd

stage of the enormous infrastructure project, Line 15. Creating a ring around Paris, Line 15 will connect suburban towns.

With 85 per cent of the Grand Paris Express network underground, monitoring structural movement across the vast network is essential to avoid potential risk to surrounding structures and the Parisian population. The leading contractor needed a reliable, accurate and high-performance monitoring system in place that could deliver the data required on such a large scale.

Following monitoring work on Crossrail's Elizabeth Line project in the UK, the new high frequency, high capacity railway for London and the South-East, Cementys is using over 100 instruments from Topcon's MS series of robotic Total Stations on Line 15 as its preferred technology.

Greater insight

When working on the Crossrail project, hundreds of Topcon Total Stations were employed along the entire line to provide ample monitoring points and highly rich and accurate 3D data of any structural movement. As a result, a high level of analysis could be made throughout the entire project, offering insights into structure movement, any elevated risk or potential impact to the surrounding areas.

Toppcon worked to provide a system of monitoring technology that could integrate with Cementys' own software systems, giving the team the 3D data it requires, but with extremely simple installation and monitoring frequencies that could be changed remotely.

Vincent Lamour, Cementys CEO, commented on the collaboration, "We have been able to integrate this open technology perfectly into our global data management system, which also includes optical fibre, vibrating wire, and other sensors."

Detecting change

Topcon's MS Series robotic total station offers high-precision angular and distance measurements. It is an ultra-high precision surveying device that continuously measures the angles and distance of prisms fixed to a structure. Any change in the measurements indicates structural movement and is immediately communicated to site engineers. The company's technology also includes its unique Matrix Detection software that has been designed to increase speed and accuracy on the measurement system. Not only does this automatically locate all prisms within a specified area – ensuring quick, reliable data - it also reduces the amount of installation time required and helps to minimise costs.

There's been some really interesting learnings from both Crossrail and Grand Paris on automated monitoring technology within tunneling projects. These learnings are vital as the number of underground infrastructure projects increases in line with more densely built-up urban areas. Using smart technology and going underground is one of the ways we'll be tackling the increasing infrastructure demands globally.

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