Evolution of bridge inspection

How can we move forward and change testing practices to protect infrastructure and innocent lives?

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***Right:* The Giatec XCell corrosion mapping device being used to detect corrosion on a crumbling building.**

The USA has faced severe scrutiny over the past few months regarding its lack of proper bridge inspection practices and failure to comply with set regulations.

In March of this year, John Oliver, the Birmingham-born comedian/reporter and host of HBO's *Last Week Tonight*, shed light on this issue within the nation. He added a comedic spin to an otherwise boring and (as both he and congressmen across the nation have dubbed it) 'unsexy' subject, going to the lengths of comparing bridge infrastructure in America to that of a crumbling Lego set. Although lampooning to attract ratings, Oliver made a significant point considering that over 70,000 of the country's bridges are deemed structurally deficient. With new advancements in technology, there is no excuse for failing to maintain these bridges, especially when people's safety is at risk.

Fatal accident

Alvord Lake Bridge was the first reinforced concrete bridge built in 1889, and was labelled a civil engineering landmark in 1969. Although concrete bridges have been constructed for over 100 years, bridge inspection standards were only implemented in 1971. After the collapse of the Silver Bridge in 1967 in Ohio, which resulted in the deaths of 46 people, bridge inspection became of higher importance to the American government and the National Bridge Inspection Standards (NBIS) were introduced in 1971.

Although this was a great initiative, it was still not enough to avoid all bridge accidents, especially considering that at the time, visual inspection was deemed a reasonable technique. Since the implementation of these standards, there have been incredible advancements in technology that are commonly known to be very effective and successful in detecting corrosion, cracks and strength, etc.

Non-destructive testing

The two non-destructive methods of bridge testing that have become popular in recent years are ground-penetrating radar (GPR) and half-cell potential measuring. GPR has only been in common use for a decade but the method has been very successful, with a low learning curve to introduce to the market. The apparatus resembles a lawn mower, which is pushed along a concrete surface, sending small pulses of energy into the material to generate images and data. The system will also detect both metallic and non-metallic materials from the surface, locating the reinforcement bar in concrete and providing a better representation of what is below the concrete surface.

Half-cell measurement has been common since 1998 and has also been adopted as a common and acceptable practice, but recently there have been major advancements regarding this method. Canadian company Giatec Scientific designs and manufactures different types of concrete

testing devices, including half-cell measurement for corrosion mapping. The firm integrates smart technology by using Bluetooth capabilities and an android tablet to have all data gathered during a standard test, calculated and stored on a smart device. This method enables data and information to be shared to other devices quickly, cutting labour costs and reducing the likelihood of human error. The company is also preparing to launch the Giatec iCor in September, the first corrosion mapping device that will not need a connection to the reinforcement.

Inspection practices elsewhere

America's bridge structures have been suffering largely in the public eye, but where does the UK stand in its inspection and repair practices?

In 2013, BBC News reported an extensive story[1] about the disturbing bridge statistics in America with no mention of similar issues in the news channel's own nation. Although the situation is not as severe, bridge inspection must still be improved.

The Malahide Viaduct collapse of 2009 in Ireland was blamed on poor bridge inspection practices and claims that the Irish rail company knew of its unsafe nature were not addressed. Luckily no one was fatally injured as the conductor of the train passing overhead recognised the warning signs in advance; however, only visual inspections were used on this bridge at the time and with the right technology this collapse could have been avoided.

Current bridge inspection practices in the UK have been sufficient thus far, as there have been very few incidents reported to the public; however, it is important to plan for the future.

The first prestressed concrete bridge to be built in-situ in Britain was Nunn's Bridge in Fishtoft, Boston, completed in 1948, which means that no bridge constructed of this porous material is over the age of 67 in all of the UK. Although this seems quite old, some bridges in America are almost 80 years old and have not been well maintained.

As the average age of bridges increases and fewer new structures are being built, it is important to have comprehensive standards in place to ensure maintenance and sustainability. As technology continues to evolve in the construction of bridges, so should the inspection processes and maintenance methods, moving beyond visual inspection. As the economy continues to rely increasingly on technology and industry advancements, the construction industry should follow suit, thus preventing future catastrophes and protecting lives. ■

Reference

1. One in nine US bridges 'structurally deficient'. *BBC News*, 20 June 2013, retrieved 3 June 2015, available at: *www.bbc.com/news/22976594*.

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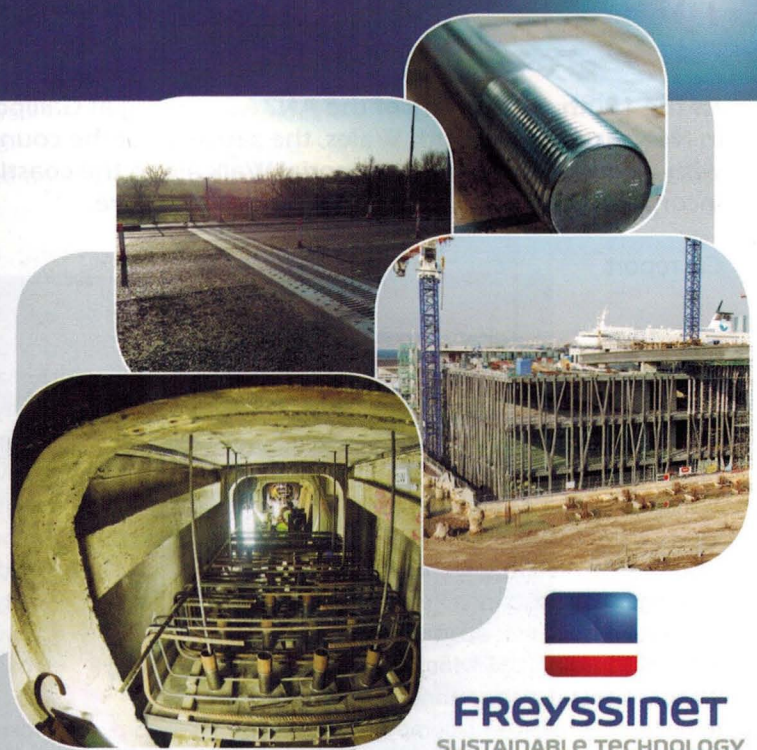

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