Powered by research

Amey has been fostering and actively adopting a less disruptive, lower cost method of stabilising road and railway embankments. The technique is slowly becoming mainstream.

A surprising statistic it may be, but cutting and embankment slopes make up £20bn of the £60bn total asset value of the UK's major highway infrastructure. As such, maintaining their stability and reacting quickly when they fail is of vital importance.

Amey has pioneered new treatments to save time and money and, has been an early adopter of a new remediation treatment which uses electro-osmosis and which has the potential to transform the way engineers handle landslips. It could also save clients previously unimaginable amounts of time and money.

Amey technical director for geotechnics Christina Jackson explains how the treatment works.

"It was initially developed by Newcastle University in the late 1990s and early 2000s, thanks to successive grants from the Engineering and Physical Sciences Research Council and the Technology Strategy Board.

"The treatment involves drilling electrodes into a failed slope and passing an electrical current through them. This causes dewatering, which consolidates and strengthens the failed soil mass," she says.

"The technique of using electro-osmosis for stabilisation is not new, but the treatment has been developed using synthetic textiles in the electrodes to enhance the system, making it more reliable and more stable."

The system works by applying a voltage to the electrodes over a period of six to eight weeks.

After that, the electrodes are left in the treated slope; the anodes are reinforced with steel bars to form permanent soil nails, while the cathodes are left in as permanent horizontal drains to reduce water pressure in the slope.

With a willing client in the shape of Highways England, Amey worked with the system's developer Electrokinetic Ltd on a major earthworks scheme at junction 7 of the M5 in 2010 . The work has more than stood the test of time. Not only that, but it has been saved time and money.

Verification tests following the first large-scale projects using the treatment showed that it reduced the slope's moisture content and increased stabilisation.

But the benefits don't stop there. According to Jackson, the treatment's carbon footprint is as much as 40% smalller than alternative treatments, such as soil nailing.

One contractor that priced the two alternatives side by side on one job found savings of 30%.

So why has the treatment taken so long to turn mainstream?

"There's a very conservative approach to adopting new technology in ground engineering because such a lot of what we do is empirical," Jackson explains.

"So you need the track record of successful projects before people begin to believe that something works. I feel it was the same for soil nailing in the beginning."

Now it has become an established treatment, Electrokinetic remediation has been used on a number of Highways England projects and Amey – along with a clutch of other contractors and engineers – has taken it to the local roads network on jobs for its local authority clients as well. It is currently going through the product approval process with Network Rail, which could open up a new work front in the rail sector.

One of the system's major advantages is the ease and efficiency with which it

The new technique only requires workers to be onsite at the beginning and the end of the stabilisation process

"We're always looking for new ways of working that make asset management processes more efficient"

Christina Jackson, Amey

can be deployed. "It's much less disruptive than, for example, granular replacement as you leave the failed material insitu," explains Jackson.

"Apart from the electrodes there is no material or waste being imported or exported so there is very little transport and no digging out of material."

What this means for clients is that there is no need for track possessions or road closures during the treatment. Access is mainly required at the beginning and end of work.

The work can also be carried out with skeleton crews of just a handful of engineers on site.

And, as is often the case with new technologies and their application, it is what could be achieved in the future that most excites those involved.

There is ongoing research into what the long-term effect of electrically driving chemicals into the soil will be.

The initial thought is that it will produce a chemical change in the soil's material properties which could be particularly beneficial for high-plasticity clay.

Amey's interest in new technologies is also around the data that remote sensing and surveys can produce.

As Jackson elaborates: "we're always looking for new ways of working that make asset management processes more efficient and automatic. The benefit of new technology is its ability to generate data that's invaluable to continually improving our asset management processes."

"It's the combination of data, our global expertise in asset management and cutting-edge technology which enables us to make really smart recommendations to asset owners."

COLLABORATIVE LEARNING AND DEVELOPMENT

Amey's collaboration with Electrokinetic Ltd , which was conceived relatively recently in the world of academia, has also contributed to Jackson being offered a visiting professorship at the University of Birmingham, sponsored by the Royal Academy of Engineering – an institution with traditionally strong links to Amey.

The tie-up with students on geotechnical courses and the new MSc in asset management is part of the university's objective to strengthen links with industry and improve the employability of its graduates.

For Jackson, the advantage is two-fold: "In part it's getting to know the students as potential future employees but it's also the input into the research programme and ideas that are useful to us as a business.

"This includes proposals for the National Buried Infrastructure Facility hosted at Birmingham, part of the £128M Government investment in the UK Collaboratorium for Research in Infrastructure and Cities (UKCRIC)."

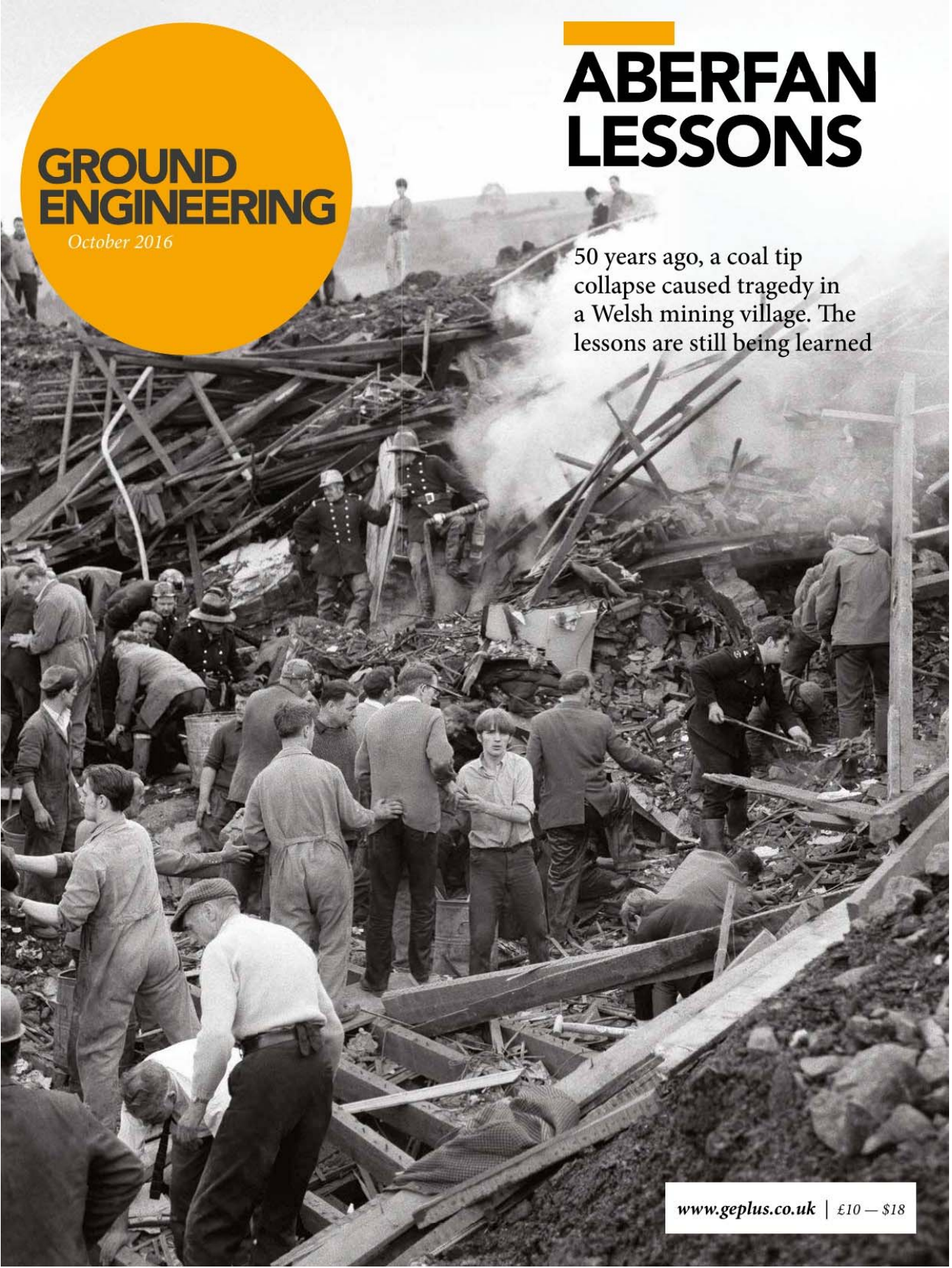
In some ways, the collaborations - both with Electrokinetic Ltd and now with the University of Birmingham – reflect Amey's belief in learning, research and development as a vital tool in becoming better at serving its clients.

"There are strong business benefits to it," affirms Jackson. "It's about coming up with innovative and effective ways of transforming the way we do things – that's always our aim."

GROUND ENGINEERING
October 2016

ABERFAN LESSONS

50 years ago, a coal tip collapse caused tragedy in a Welsh mining village. The lessons are still being learned



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