Dirty business

Academia/industry collaboration hopes single system will aid brownfield site reclamation

CAMBRIDGE UNIVERSITY'S Department of Engineering is taking part in a project to develop equipment that could help reclaim contaminated brownfield land for housing or commerce.

According to the Environment Agency, in England and Wales alone there are an estimated 300,000 hectares of contaminated land at over 350,000 sites.

Many brownfield sites are also unsuitable for buildings because of weak soil. Soil mix technology (SMT), which uses a range of tools and additives to mix soil with a cement binder, is one way land can be made safe.

The Soil Mix Remediation Technology (SMiRT) project aims to develop a single SMT system for integrated remediation and ground improvement, with simultaneous delivery of wet and dry additives, to make the process more cost effective.

'The process churns the soil in place and breaks it up into many small parts, then the cementitious material [which has the quality of cement] will be injected and mixed with the soil.' said Cambridge's Dr Abir Al-Tabbaa. 'One of the advantages of this technique is that it can deal with everything from heavy metals to inorganics and organics,' he claimed.

The technique uses either dry powder or mixes the cement as slurry. However, the equipment the team hopes to develop will be capable of mixing both forms to increase flexibility and mean that only one piece of equipment is needed on site.

The technology can also be used for other methods of remediating contaminated land, such as constructing permeable reactive in-ground barriers or low-permeability containment walls. These allow water to pass through them, but keep hold of contaminants.

Remediation can be a costly process, requiring a large amount of heavy equipment to perform a variety of tasks. Moving this is expensive and can even require a police escort, so the team hopes that creating just one piece of equipment capable of performing multiple tasks will reduce these costs.

Another area the team aims to improve is the materials used in the process. Researchers are performing extensive laboratory treatability studies on conventional and novel binders and additives to find the best material to use.

'We are looking at a wide range of materials for additives, some conventional like cement and others innovative like magnesia cement,' said Al-Tabbaa.

'This is new and not commercially available in the UK yet. It's a more sustainable cement. Not only are much lower temperatures used to manufacture it, making it much less energy intensive, but also as the magnesia hydrates and carbonates it reabsorbs carbon dioxide so it can act as a carbon sink. It also deals with impurities better and is more durable,' he claimed.

'Other materials we are testing include zeolites. These are not often used in the UK, as we don't have them naturally, but they provide advantages in terms of strength and durability.'

A major concern for the researchers is the fact that contaminants are left in the soil, held in place by the cement matrix that could eventually degrade.

'This technology does not actually remove contamination from the ground,' said Al-Tabbaa. 'You either stabilise the soil, basically gluing it together with a cementitious material, or you put a permeable wall in the ground where you have contaminated ground water.

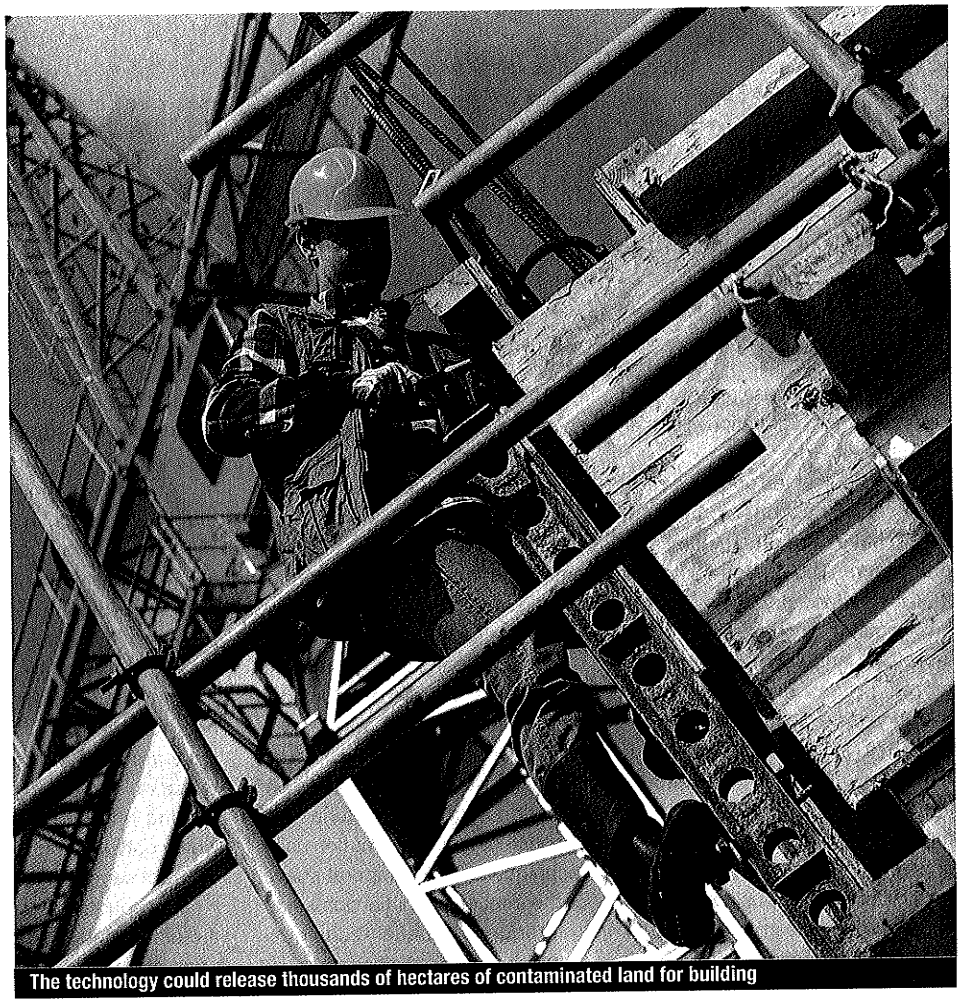
'So although you have clean water coming out, the contamination is still concentrated in the wall material and at some stage that will have to be removed. Because of that there is some concern about the longevity of this technique and so part of this project is to work closely with a wide range of stakeholders and make sure we address their concerns.'

To help address these reservations the team will be undertaking accelerated ageing tests to help predict the effects of the contaminants in 50 to 100 years. They have also involved the organisation Contaminated Land: Applications in Real Environments (CL:AIRE) to examine the impact.

The SMiRT project, which is funded by the Technology Strategy Board, will run for three years. It is being led by Bachy Soletanche, which is developing the equipment, and also includes three engineering consultants, three trade associations and four material suppliers.

Field trials will take place in the first half of next year where *in situ* tests will be taken and the performance of the project will be assessed.

Tim Gee



The technology could release thousands of hectares of contaminated land for building