



Baling out: Tyre bales are being used for a 240m long stretch of carriageway construction

TREAD CAREFULLY

A section of the A421 is being built with recycled tyre bales, debunking the myth that road building has to be carbon intensive. Gemma Goldfingle visits Bedfordshire's pioneering project.

The A421 is a key part of the east-west corridor and an essential link between Cambridge and Oxford. It lies within Marston Vale, an area designated in the Bedfordshire Structure Plan as a strategic growth corridor in need of economic and environmental regeneration.

Here, the A421 between the M1 and Bedford is largely single carriageway, apart from a short length of dual carriageway at Marston Moretaine. With more than 25,000 vehicles a day travelling along this stretch, there is considerable congestion, particularly during peak hours. The Highways Agency is investing £200M to transform this gridlocked route by building 13km of new dual carriageway alongside the existing road.

There is limited space to build where it runs past Brogborough Lake in Bedfordshire as ground here is made up of slurry, so instead the existing single lane road is being realigned to make way for the new route. This realignment will be done at the same time as dual car-

riageway construction, so a temporary bypass is being built to take traffic. The bypass will later form part of the local network.

Some of the bypass route runs across a former slurry pit, a factor that posed a few problems for contractors. With over 20m of very soft slurry material forming the base of what will be a busy road, consultant Scott Wilson and contractor Balfour Beatty had a challenge ahead of them, a challenge that turned into an opportunity to pioneer a sustainable road building technique.

"We have really soft material of 25kPa to 35kPa here and to use a piling solution for the road foundations, we would have had to drill down 29m. This would not be feasible. Fill options were equally as limited. Only incredibly lightweight material could

be used, which is often expensive," says Scott Wilson associate Ivan Hodgson.

Maxit, a lightweight expanded clay aggregate that is 75% lighter than normal fill, was thought to be the only viable option, until the idea of supplementing this with old tyre bales was mooted.

There are ample benefits in using tyre bales. They are a similar weight to Maxit but are about £25/m³ cheaper. Environmental benefits are also substantial as the tyres would otherwise have had to be incinerated. Tyres could also be sourced locally, whereas Maxit has to be imported from Denmark.

Scott Wilson brought this idea to the Highways Agency, which was keen to explore its possibilities. "It fits in perfectly with our sustainability agenda," says Agency geotechnical adviser Alex Kidd. "We are always keen to integrate recycled materials into road construction. The fact that we stand to make a substantial cost saving makes the prospect even more appealing."

Tyre bales have been piloted on a few schemes in Scotland, but these are limited to subgrade improvements in areas of peaty ground. The A421 project team has used the resources of transport research body TRL director Mike Winter, who pioneered

"This is the first major undertaking of tyre bale road construction, programme times can only improve"
Ivan Hodgson,
Scott Wilson

the use of tyres on Scottish road projects.

The success of the tyre bale fill centres on keeping its long-term settlement to a minimum.

Tests from the Scottish pilots showed that only 1.1% of creep was measured over a 35-month period.

Since the bypass will eventually be maintained and operated by Bedfordshire County Council, the Agency and project team had to guarantee their buy in. In addition to posts for structural stabilising, further research was also carried out by BRE to guarantee that the tyre bale foundations would not be flammable.

The bales have a 50-year design life and the Agency is confident that the foundations will not require any more maintenance than a conventional

road and has offered Bedfordshire County Council a warranty on the design.

Maxit is first used to form a level platform, on top of which a layer of tyre bales is laid down along the 240m stretch. Each bale holds approximately 100 old tyres, two or three tyres wide. These are compressed and tied with wire. The material has a density of 500kg/m³ and a stiffness of 80MPa. Despite the newness of the technology, there is already a standard for using tyre bales. It is called Pas 108 and requires that tyres used in construction must not be split or damaged in any way. This is to ensure that they do not pollute the surrounding ground.

After one layer of tyre bales is laid, Maxit is used as fill for voids between the tyres and is vibrated down. Geotextile is then laid on top of the bales to prevent migration of fill and another tyre bale layer is added. Up to six layers were piled up to build the road foundations to the requisite height near Brogborough Lake. Previous applications of tyre bales to roads in the UK have been limited to a single layer.

Once completed, the bales are finished with 1m of fill on top. A surcharge load is then added to induce settlement. Extensive

drainage laid beneath the tyre bales helps to accelerate settlement so the surcharge is only needed for six months.

During this time, TRL will monitor vertical and lateral displacements, as well as pore pressure changes. Once the surcharge period is complete, conventional clay will be placed on top, followed by traditional asphalt pavement construction. Tyre bale installation began in May and was due for completion in early July. Using this method has taken slightly longer than conventional methods. But while bad weather has blighted other parts of the project, the tyre bale construction is one of the few activities that has continued regardless.

"This is the first major undertaking of tyre bale road construction," says Hodgson. "As we fine-tune the process, programme times can only improve."

With substantial cost and carbon savings, the Agency will be disseminating information about the project internally for consideration as a possible construction method for the UK's road network. The road is due to be fully operational in February.

More geotechnical features in the October issue of Ground Engineering. For more information go to www.geplus.co.uk

