Heidelberg Materials

Project case study

Low carbon asphalt solutions, A414, Hertfordshire

Product

- Tufflayer SAMI: 2,984 tonnes
- Heidelberg Materials ERA warm mix asphalt containing Shell Bitumen LT R: 940 tonnes
- Heidelberg Materials REA (reduced emissions asphalt) containing Shell Cariphalte AgeSafe: 530 tonnes

Client

National Highways

Project overview

A collaborative approach to working led to the development and trial of innovative low carbon asphalt solutions on a key strategic route in Hertfordshire.

Heidelberg Materials UK
Second Floor, Arena Court
Crown Lane
Maidenhead
Berkshire SL6 8QZ
heidelbergmaterials.co.uk

Project description

National Highways has set some challenging carbon reduction targets – including delivering net zero road maintenance and construction activities by 2040. In order to achieve this, the organisation is working with its supply chain to trial the innovative solutions they are developing to reduce carbon emissions and create a more resilient strategic road network.

The asphalt industry is working hard to ensure it plays its part in reaching the government's net zero carbon ambitions and materials innovation is an important part of this. Heidelberg Materials' involvement in the National Highways Area 6 & 8 framework agreement allowed it to work collaboratively with designer Atkins to develop and use innovative low carbon asphalt solutions on the A414 in Hertfordshire, which provides a key strategic route between St Albans and the M1.

A 15-kilometre section of the road required upgrading due to extensive transverse reflective cracking caused by the underlying concrete road. The design of the scheme was particularly challenging due to the limited asphalt cover – less than 70mm in places – overlying the concrete, which made traditional crack mitigation techniques unsuitable.

Working with Atkins, Shell Construction and Road and National Highways these technical challenges were overcome to deliver a resilient, low carbon solution. The process was facilitated by National Highways' safety, engineering and standards team, which enabled a departure from standard to be approved quickly to allow the use of innovative materials on the scheme. The issue of reflective cracking was addressed using Heidelberg Materials' Tufflayer stress absorbing membrane interlayer (SAMI), an alternative to geogrid asphalt, which provides flexibility, enhancing fatigue resistance and significantly delaying the effects of reflective cracking. It also protects the lower layers from water ingress, providing further resilience. The SAMI was then overlayed with a thin asphalt surface course, 50mm in thickness, which trialled different new low carbon solutions.

The asphalt on the westbound carriageway included Shell Bitumen LT R, a low-temperature binder which includes additives derived from chemically treated waste plastic, reusing the material and preventing it from going to landfill, supporting the circular economy. Its use on the project saved an estimated 450kg of plastic waste as well as a tonne of CO2- equivalent emissions per kilometre of road paved. The project was the first time asphalt incorporating end of life plastic has been trialled on the SRN.

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It was produced and laid at a lower temperature using Heidelberg Materials' ERA warm mix process, which reduces energy consumption and associated carbon emissions by up to 15 per cent. As a result, the production of the 940 tonnes of LT R used on the project generated a carbon saving of 2,246 kg of CO2 – the equivalent of driving more than 51,000 miles, or twice around the world.

On the eastbound carriageway, Shell's Cariphalte AgeSafe binder has been used, which reduces the rate of bitumen ageing to delay the onset of embrittlement and prolong the life of the asphalt surfacing, reducing the need for intervention and further cutting carbon emissions. This asphalt was produced using Heidelberg Materials' REA (reduced emissions asphalt) process, which incorporates Shell Bitumen FreshAir, and helps to minimise the impact of asphalt production and laying on local air quality by reducing specific gases and particulate matter from asphalt mixtures.

The scheme's innovative approach was not limited to the materials themselves. As part of the project, a shuttle buggy was used to provide a constant supply of asphalt to the paver, in combination with the latest levelling technology, to enhance the smoothness of the road.

This approach has been successfully used internationally, but the A414 represents one of the first applications to a maintenance scheme in the UK. The smoother surface, installed without joints, creates less friction with tyres, reducing fuel consumption and ongoing CO2 emissions throughout the life of the road. The finished surfacing has also improved ride quality for road users which helps extend life to the next intervention as well as reducing noise.

Collaboration was key to the success of delivering so many innovations within a single scheme and the performance of the different combinations of materials will be closely monitored to see how they react compared with the control sections and how they might be able to be used on other schemes across the country.

Heidelberg Materials, Atkins, Shell Construction and Road and National Highways developed a 'one team' approach and worked together to deliver the project with a collective focus on reducing the carbon footprint of the scheme and providing a more resilient road.

The use of the innovative long life and sustainable materials is expected to deliver a 45 per cent reduction in whole life carbon emissions and generated a whole life cost saving of £450,000 through the elimination of future maintenance interventions and reactive repairs.
Puru Loganathan, senior pavements advisor at National Highways, said: "Reducing carbon emissions is a key priority for us, as is delivering long lasting smooth roads which connect the country.

"It has now been over a year since we launched our net zero plan, which comprises some challenging net zero targets – including all of our maintenance and construction activities being net zero by 2040."

"If we are going to achieve net zero in a timely fashion, we need to collaborate with our supply chain to explore the innovative solutions they are developing to reduce carbon emissions and create more resilient and sustainable roads. We are excited about the results this new trial will bring, and hope the technology used can extend the life of our road surfaces across the country."