The Project

London Underground has long grappled with the problem of how to cool its tunnels and it wasn’t that long ago that the Mayor offered £100,000 for an answer to Tube passengers’ summer woes. With increased railway operations and higher passenger numbers, temperatures have been increasing significantly, resulting in a considerable impact on the whole journey experience of customers, the well-being of staff and also causing more frequent equipment failures.

In 2012, London Underground Limited successfully delivered an innovative and ambitious cooling project at Green Park, demonstrating that, at least for stations, there is a feasible solution and saving £30,000 a year versus chillers alone.

Working closely with partners across the Construction Industry, optioneering determined it best to mount Platform Air Handling Units to tunnels above the track. These seven metre, four tonne units were brought into position by train and lifted safely into position during engineering hours. Coupled with the novel construction methods within such a unique and challenging environment and the sustainable use of groundwater cooling, the project is paving the way for a cooler and safer transport network.

Winners at the Rail Business Awards for Environmental Innovation and shortlisted for awards at the National Rail, Construction News, Ground Engineering and BCI Awards, the cooling programme has improved the physical and social environment at this station.
The Benefits

The fundamentals of sustainable design were adopted as a core principle. At Green Park, the cooling is provided by cold water drawn from an aquifer below the Royal Park. This use of borehole water is an energy efficient alternative to traditional chiller systems.

Key environmental benefits were delivered at Green Park in comparison to chillers alone (such as at Oxford Circus), saving 350,000kWh and 150t of carbon dioxide annually; realising energy savings of £30,000 annually and a reduced carbon footprint.

The system was adapted to also allow the majority of waste heat to be re-directed to local businesses; thus reducing energy wastage and simultaneously minimising the environmental impact on the aquifer.

The continuous flow of cool air has reduced the ambient temperature on the platforms by 3°C and since temperature impacts on the willingness of customers to travel; this benefit is predicted to generate additional demand revenue. Being able to control temperatures also increases the period between equipment failures and/or planned maintenance interventions, with a resultant reduction in operational expenditure.

The project is improving the whole journey experience of passengers and the well-being of operational staff and demonstrates that the technology can be rolled out at other stations.

The Process

Due to the high passenger numbers expected during the Olympics, the programme start was brought forward by a year and delivery accelerated from 18 to just 6 months. To ensure success, a project team of key individuals was assembled that worked collaboratively with the pre-qualified supply chain.

Suitably empowered teams were co-located to ensure issues were resolved expediently. Assurance was risk-based and proactive engineering involvement through project lifecycle ensured quality was not compromised.

As Green Park is an operational station, the majority of works were confined to the 3.5 hours during which the Service is shut. This focused the project on maximising productivity and additional access was gained through novel agreements with Operational staff.

The use of borehole water required London Underground Limited to meet strict conditions of the Environment Agency license and ensure the aquifer remains unaffected. Similar agreements were made with the Royal Parks, to minimise any impact on the flora, and adjacent landowners.

Key Learning Points

The scheme has given a proof of concept for other such sustainable schemes that may be delivered on the Underground as well as providing a platform for the testing of critical sub components such as the air handling units.

Having two separate water circuits ensures that aquifer water does not have to flow throughout the whole. Pressure and temperature could therefore be better controlled and regulated and also minimised any risk of reinjection or pollutants back into the aquifer.

The scheme has demonstrated that groundwater cooling technology is more environmentally friendly than the alternative of power hungry chillers.

The work is furthermore an illustration of a wider plan of work to make the tube more comfortable for our passengers and improve the overall customer experience.

End User Feedback

The schemes have delivered temperature reductions at the platforms of up to 3°C and were important in providing better conditions in what turned out to be a quite warm period during the Olympics. The response has been noticeable and favourable.

It has also given LU the ability to manage the additional heat at these locations from line upgrades which are necessary to provide the additional travelling capacity needed for London.

The project team has received recognition from TfL for “consistently demonstrating exceptional behaviors; showing a significant degree of ownership and dedication; and going significantly above and beyond to facilitate the success.”

For more information on The Green Construction Board visit www.greenconstructionboard.org or email green.board@bis.gsi.gov.uk