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How HS2 will maintain its network using Virtual Reality and ‘digital twin’ technology

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HS2 is using virtual reality and real-time monitoring technology built into infrastructure such as rails, bridges and overhead lines in a push for greater reliability.

It said that engineers are preparing designs using the latest software. The data produced from this work will inform construction and help build a ‘digital twin’ – a 3D replica as detailed as the real thing.

The sensors, HS2 said, resemble those used in Formula One and aviation, and this will help anticipate potential failure to boost reliability.

This information is then built into the digital twin, allowing HS2 to have a complete virtual replica of the network.

Sensor data collected by its trains will be transmitted directly to HS2’s Birmingham-based Network Integrated Control Centre (NICC) at Washwood Heath.

There, engineers and maintenance teams will analyse data with the use of Artificial Intelligence to monitor

asset performance trends across the network. Any sign of a downwards trend will mean a triggering of HS2's predict-and-prevent maintenance programme.

However, the teams will not necessarily deploy to the site immediately.

Instead, before going out, engineers will use virtual reality headsets to investigate issues from the safety of the NICC. The technology will enable maintenance teams to understand issues and in some cases resolve them without having to go out on location.

The benefit of operating a "predict and prevent" system on HS2 is it will enable parts to be repaired and replaced when the asset tells the teams – rather than relying on a rolling programme of maintenance and renewals.

Head of strategic planning and asset management, David White said: "With HS2's digital twin-based predict and prevent approach to maintenance we have the ability to prevent failures and replace assets when the system indicates a decline in performance – as opposed to relying on a rolling programme of asset replacement.

"Harnessing the power of the digital twin and its predictive capability could see an asset's operational life extended by months or even years. This will enable us to reduce cost, cut waste and shrink the environmental footprint of HS2's maintenance operation and maintain a consistently high level of customer service.

"HS2 will be very safe and reliable, not least because it will be new and built to the latest standards. This in itself creates the challenge of keeping staff trained and competent to run and maintain both the railway and its stations. So we will create new tools through the use of virtual and Augmented Reality technologies to maintain and enhance the skills of our maintenance and station teams."