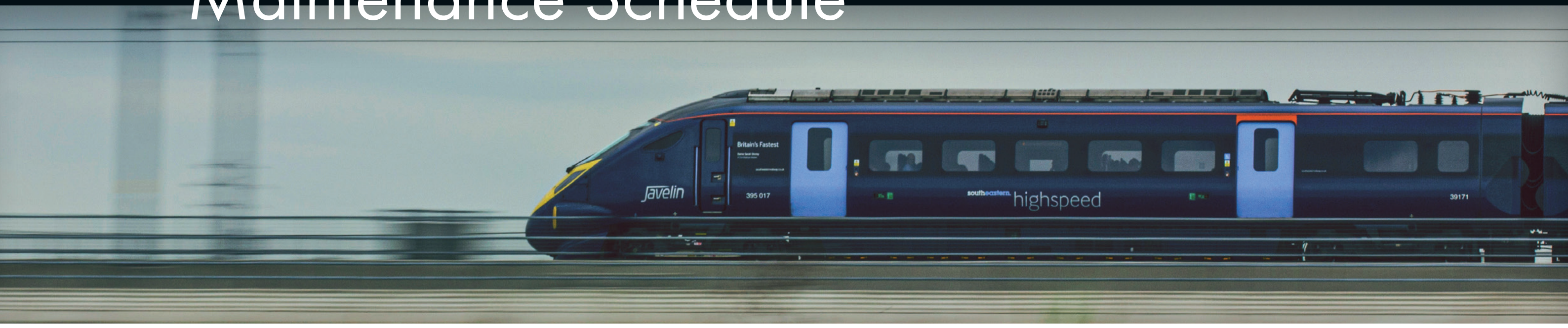
Transforming Southeastern's Maintenance Schedule



CHALLENGES

To improve the reliability of train service for over 64,000 passenger journeys every week day.

To reduce the maintenance schedule for the train fleet while maintaining high levels of safety of axle bearings.

To retrofit a cost effective remote condition monitoring system with minimal disruption to services.

THE SOLUTION

Retrofitted Hitachi's battery-free, wireless Remote Condition Monitoring system.

The train network between London, Kent and parts of East Sussex has been run by *Southeastern* since 2006. It is a train company that moves around 64,000 passengers on 2,016 train services every weekday, manages 367 trains and serves 180 stations. It is one of the busiest networks in the United Kingdom.

Back in 2006 *Southeastern* faced a challenge: the maintenance schedule on its Electrostar fleet was not at its optimum. While the manufacturers specified each bearing should run for around 1.4 million miles before being changed, the company had capped the overhaul periodicity at 480,000 miles and the bearings were replaced almost a million miles before the manufacturers said they should be. The company wanted to extend maintenance times, but keep safety paramount.

"A train has 64 bearings and 63 of those may run many more miles closer to the expected 1.4 million miles," says Mark Johnson, Engineering Director at *Southeastern*. "But there may be one bearing that will fail around the 500,000 mile mark. If that bearing fails at the wrong time in the wrong place it has the potential to cause significant disruption or even a possible derailment. Therefore we had to limit our maintenance optimisation due to the potential safety implications. It was the right thing to do, but that meant throwing 63 bearings away because one has failed in early life."

RCM

This is where Remote Condition Monitoring (RCM) came in. RCM gives operators a clear understanding of real time changes, using data to improve the reliability and safety of fleets while reducing operational and maintenance costs. It gives a timeframe for maintenance, allowing an operator to plan for a unit visiting the depot, ensure material resources are on-site and to book an engineer.

But *Southeastern* required more than just an RCM solution: it demanded a robust system which would prove cost effective within the franchise timeframe. Retrofitting an RCM system to a fleet which is already operational can prove cost prohibitive mainly due to the extent of associated hard wiring involved. Hitachi's self-powered, wireless sensing technology and vibration engineering expertise was an ideal solution. As Mark says, "What led us to adopt the solution was the simplicity of being able to retrospectively install it".

THE TRIAL

To establish if Hitachi's RCM system would be suitable, the com- pany ran an 80 unit trial over 18 months. Hitachi worked very closely with *Southeastern* to ensure the product matched the rail company's precise requirements and tailored the product to fit.

"Hitachi was fully engaged and focused on how to make its product the best it possibly can be," says Mark. "The company wasn't focused on money – it focused on quality. When initially installed we experienced higher forces than expected, that over time would degrade the nodes. This led Hitachi to redesign the sensor to a higher specification, resulting in a sensor that can survive the harshest of conditions."

Hitachi's technology is easy to install and requires no external maintenance. Its electromagnetic energy harvesters convert mechanical energy produced by vibration to electrical energy, powering the wireless sensor nodes. These nodes transmit real time data back to the desktop or mobile device at *Southeastern*. The energy harvester is designed to last over 100 years without maintenance, and the sensor nodes 20 years.

IMPACT

Prior to the installation of the Hitachi energy harvesters, *Southeastern* could expect to see signs of bearing degradation in around four or five bearings each year, with the train then being removed from service and taken to the depot, passenger journeys interrupted and trains cancelled.

> Since the installation of the Hitachi system across its fleet there have been no in-service bearing failures. *Southeastern* has also seen significant cost savings.

"We have moved away from a routine change-out bearing programme to an on-condition maintenance programme," says Mark. "The cost of replacing one bearing against the cost of replacing 64 bearings is significant."

The information the Hitachi solution provided was everything *Southeastern* expected – and more. *Southeastern* were at first looking for warning data that would signify bearing degradation, but soon realised they could also use it to inform tyre tread, wheel defects and track condition.

Effective asset management is key to running an effective train franchise and *Southeastern*'s partnership with Hitachi has been wholly positive. "Hitachi has a passion and a desire to find solutions surrounding and relating to RCM," says Mark.

"Hitachi has always looked at what it can do to meet our needs and how it can adapt its products. It is a very forward thinking company, challenging the industry in terms of the way people approach technical problems."