CASE STUDY

Angel Trains - Train Asset Monitoring

CGI ensures that Angel Trains has a comprehensive set of data to give a full picture of the condition of its trains. This performance monitoring provides the potential to reduce repair costs and improve the reliability of the trains.

Angel Trains Ltd is one of the UK's leading train leasing specialists. It was created in 1994 as one of three rolling stock companies in preparation for the privatisation of the rail industry.

As part of a commitment to provide a better service to its customers, Angel Trains Ltd was focused on monitoring the performance of its trains to catch any maintenance issues at the earliest opportunity. This performance monitoring provides the potential to reduce repair costs and improve the reliability of the trains.

Angel Trains Ltd had already undertaken some data monitoring on its trains with the data being sent to an online Internet of Things (IoT) system.

The principle of the Internet of Things is predicated on the successful interconnection via the internet of computing devices embedded in everyday objects, enabling them to send and receive data. However, in this particular instance, Angel Trains Ltd felt that data analysis of the existing IoT system was poor and did not provide them with a complete overview.

Key benefits:

- Improved asset reliability and reduced operational cost due to access to data and insight
- Hidden failures highlighted within monitored rolling stock through the enhanced algorithms
- Rapid changes in direction to address immediate operational concerns due to the flexible development 'sprint' methodology

The project referenced in this case study was delivered by Xibis, part of SCISYS, which CGI acquired in December 2019

Internet of Things technology effectively merges data

Graham Dutton, Product Technology Manager at Angel Trains Ltd commented: “The priority for Angel Trains Ltd is to lease vehicles to clients. I had no idea about data processing, portals and interfaces – I just knew that there was certain information I needed and I needed it in an easy to understand format.”

To achieve this, the web and mobile application development company integrated its proprietary IoT platform with Metron2 devices, installed on the trains.

The devices monitor up to four inputs such as fuel level, coolant level, alternator temperature and cabin temperature. Data from the devices is sent out every five minutes and collated by a third-party platform, Powelectrics.

Our platform was configured to merge GPS data, taken from wifi routers, with the Powelectrics data. By integrating them, the new system provided a comprehensive set of data to give a full picture of the condition of the trains.

Graham said: “I was able to tell CGI what I needed in the autumn, and the system was up and running by Christmas which helped ensure thousands of passengers had reliable journeys over the festive period.”

Analysing journey times

With the location data combined, the interface made it easy to compare different cabins on the same train or different trains making the same journey at different times. Journey segments were identified and the length of time it takes vehicles to cover that segment (‘segment traversals’) recorded. An expected time was calculated (with a plus and minus tolerance) and alerts are triggered when the journey takes significantly more, or less, time than expected.

This pattern of ‘segment traversals’, and the visualisation of, enabled the identification of any train that is performing differently to the others, which could be a sign that it needs some work or that drivers need to adjust their driving behaviours.

“The system removes the hard, complicated task of processing the data and simply provides me with a comprehensive picture of what’s going on with the trains. The patterns identified by the data analysis enables me to provide added value to my customers by informing them of potential leaks or inefficient fuel usage or increasing temperatures. This all enables Angel Trains Ltd to provide a more responsive and accurate service to customers.”

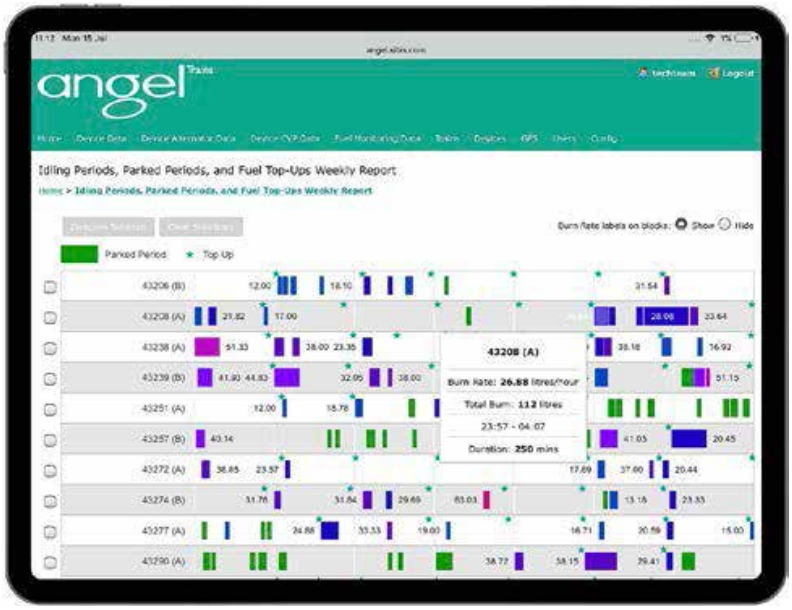
Graham Dutton
Product Technology Manager,
Angel Trains Ltd

Picturing how data analysis can support coolant monitoring and fuel economy

The platform takes the sensors' data from Powelectrics and processes it. A report is then prepared for Angel Trains Ltd to view on a dashboard. The dashboard shows, at a glance, patterns of fuel and coolant usage, and cabin temperatures.

The pattern of, for example, coolant use is important. Individuals may top up the coolant at certain points with no idea when it was last filled. The system identifies and logs when coolant top-ups occur. A dashboard displays the occurrences of top-ups identified over a short time period, and if there is a significant number this can indicate a leakage problem.

The system also includes an alert feature that triggers an alarm if coolant levels fall below a certain threshold or if the levels drop steeply. Again, if the dashboard shows this happening too often, it could mean that a leak has been identified.

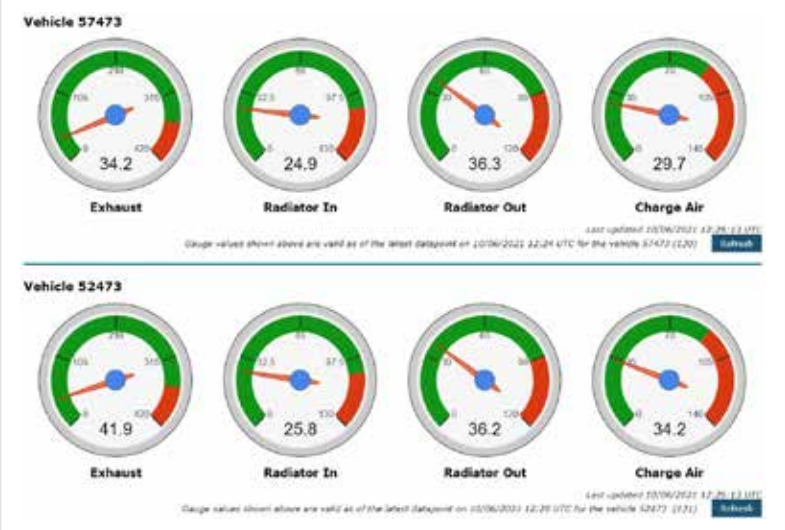


Fuel level monitoring is also in place and simple processes are in place to identify fuel top-ups and how much fuel was filled. Though more complex processes have been implemented to identify when vehicles are stationary and potentially idling (being stationary with the engine on - idling - uses fuel) by analysing fuel levels and usage.

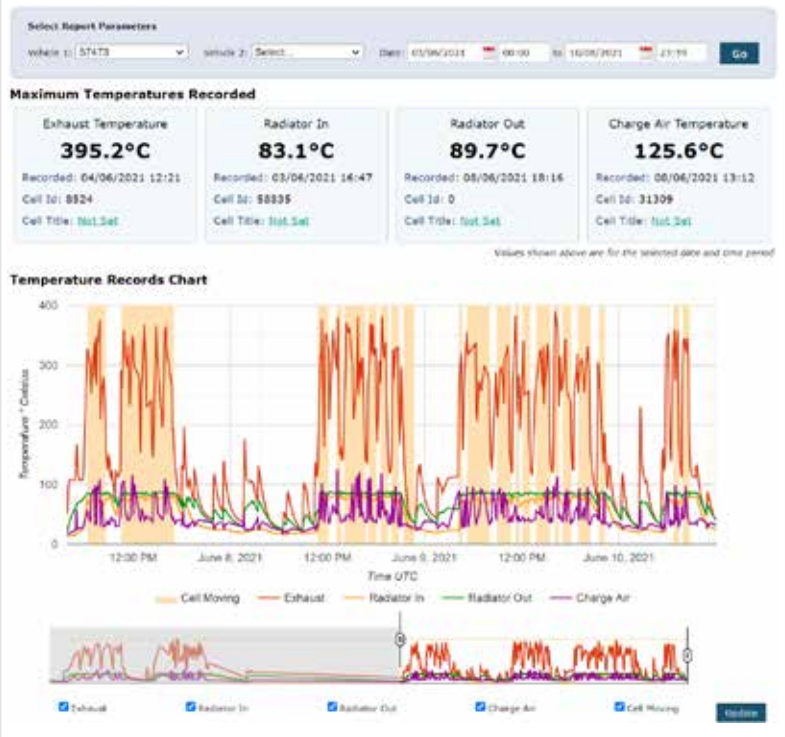
Some older vehicles do not have GPS, and this is were the monitoring of fuel levels can be used to identify when a vehicle is stationary, and then go even further to identify if the engine has been left idling and therefore burning fuel. This allows for stationary and fuel idling reports to be generated and to enable Angel Trains to identify vehicles using fuel unnecessarily and/or are inactive (stationary) for large periods of time.

Monitoring train performance

As part of a commitment to provide a better service to its customers, Angel Trains is focused on monitoring the performance of their trains to catch any maintenance issues at the earliest opportunity. This performance monitoring reduces repair costs and improves the reliability of the trains. As a result, there was a requirement to monitor temperature sensors for a set of engines in operation. We were tasked with building an interface to visualise the temperature data pulled from the third-party platform Powerelectrics.



Our teams developed a new method to process the temperature data for different engines on a train. This data would then be used to visualise the state of an engine on a dashboard designed and developed by our team within the existing solution.



"The CGI team has been very flexible – responding to my requirements and being very flexible in order to provide exactly what I need. I am confident that, through the CGI platform, I can obtain the information I need quickly and without the need to spend hours processing data. It works seamlessly with our existing monitoring system and produces accurate, timely and highly useful information."

Graham Dutton
Product Technology Manager,
Angel Trains Ltd

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A key functionality for Angel Trains was to identify when the vehicle is in a moving or idling state, to enable them to diagnose whether the engine is functioning as per specification and catch any potential issues. We collaborated with the Angel Trains team to devise a solution to identify these elements using the closest data point to the vehicle.

Technology makes monitoring easier and faster

Our solution soon reaped great rewards. It reduced the time taken to identify when trains had problems with their cooling equipment, had cabins with windows left open, or were left idling for long periods of time, unnecessarily burning fuel.

The application processes a large amount of complex data and delivers it to Angel Trains Ltd in a manageable, more efficient format, enabling them to take meaningful information from it.

Evolving the application

Work to develop and enhance the application is ongoing. Current GPS data is taken from wifi routers and sent to the system overnight. The system then analyses the data and identifies stationary periods, speeds and distances travelled. This can then be cross-referenced with fuel usage to identify waste, for example. Future plans include incorporating the ability to identify real-time GPS data and integrate it with existing data sets.

About CGI

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Founded in 1976, CGI is among the largest IT and business consulting services firms in the world.

We are insights-driven and outcomes-based to help accelerate returns on your investments. Across 21 industry sectors in 400 locations worldwide, our 77,000 professionals provide comprehensive, scalable and sustainable IT and business consulting services that are informed globally and delivered locally.

For more information
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