PROVIDING INSIGHTS TO EXTEND SERVICE LIFE

Airport buses play a key role in airside operations, transporting passengers between the terminal and remote aircraft stands. If they break down, it disrupts operations and results in bad publicity as the incident will get posted on social media. The right data and analytics can detect issues and stop them from disrupting operations.

Gonçalo Souza, Data Analyst at COBUS said that the battery is the most valuable and expensive component in the bus so it is essential to know how it is behaving. This is why COBUS contacted Hitachi to measure analytics from the battery.

Colm Gallagher, Chief Data Scientist at Hitachi ZeroCarbon, said the COBUS use case is interesting because airport buses do lower mileage with higher hours of operations, which was different from previous experience with city buses. This took time for the Hitachi team to get their heads around as city buses often do high mileage throughout the day while airport buses sit idle for longer periods. This means the energy throughput from the battery is different.

Successfully deploying electric-powered equipment requires battery management. Colm Gallagher, Chief Data Scientist at Hitachi ZeroCarbon and Gonçalo Souza, Data Analyst at COBUS explain how they are analysing battery performance.

He said: "Our BatteryManager product takes the rich data set of operations from the vehicle. COBUS vehicles report to us on a daily basis, some with between half a million and a million data points per bus per day, which is used to understand operating stress of the vehicle, energy available for operations and alerting features fed back to the COBUS team."

The COBUS partnership is Hitachi's sole ground service work as Hitachi primarily works with city buses. In the UK, Hitachi has a partnership with First Bus using the ZeroCarbon BatteryManager product in around 650 buses.

To understand the data, COBUS and Hitachi are having regular meetings with Souza saying the data had flagged up an issue with the battery which the engineering team at the OEM are investigating. Gallagher admitted there is a learning curve so the quarterly meetings are useful to validate the data and understand trends.

On the dashboard, there is a summary of assets being monitored with a flag for any alerts on the asset. Users can take a deep dive to view the state of health, historical trends, state of balance charge and thermal management as these influence battery safety and degradation. Asset utilisation is another feature that can be monitored.

An interesting insight from the summer period, especially in hotter locations, the hot temperatures meant the battery pack was getting hot. This information was fed back to the COBUS team to look at thermal management, said Gallagher.

Souza added: "We recommend battery sizes to customers before they buy a bus. They need to share the average temperature of site as this affects the range so we may need to change the battery size and dimensions."

Gallagher said 20-25°C is the optimum temperature. Extreme heat and cold affects day-to-day operating efficiency but its long-term impact on battery health in ground services is not known, said Gallagher. COBUS and Hitachi have only been working together for a year so it will take longer to get more conclusive answers.

In the first 12 months, COBUS and Hitachi have been trying to understand the data and now they are growing their knowledge so they can provide better insights with customers, said Souza. Gallagher said feeding insights back into R&D for vehicles to help engineers is a key achievement to date. They have also identified vehicle operation insights which are being fed back to customers, giving them advice about good practices, he added.

Something they have found is customers frequently fully charge vehicles, partly discharged then fully recharged. Gallagher said Hitachi recommends a deeper discharge every few weeks to give the battery a chance to rebalance across cells, which is better across the battery's lifetime.

Souza sees a future where customers are provided with extra services, teaching them how to use the vehicle and maximise battery life, and not just selling customers a bus.

Gallagher is excited thinking about how the relationship could develop, saying: "It is a first for us working in this sector of buses and potentially for the industry to provide this level of oversight with proactive behaviour around batteries. From next year, the question is how can we feed this back to battery operators as possible, making day-to-day operations better and maximise the value of the investment they made into decarbonisation by making sure these last as long as possible by encouraging good behaviour throughout the lifetime." ***ghi***

Gallagher said: "If you go into the dashboard and see a red flag, it will give you a summary of likely causes and fixes and you can jump into the detailed data to assess it second-by-second."

Souza added: "It is really easy to understand, we are improving our knowledge of the tool and we can understand each alert, what triggered it and do a deep analysis. With our telematics dashboard as we can analysis signals on our side, we can understand triggers creating alerts."

He said COBUS wants to understand the state of health for batteries because there are warranty conditions with the supplier and COBUS wants to give its customers a good service, which requires healthy and long-lasting batteries. The data means COBUS can work with customers to encourage good behaviour which will maximise battery life. Customers who are buying the bus second-hand can see battery performance from when the bus was new.

Using Hitachi ZeroCarbon's BatteryManager, COBUS can get a long-term overview of battery performance, complementing the battery state of health calculated on board, which tends to provide more short-term information. It also provides independent oversight of battery performance.

Battery performance is affected by factors such as the weather through natural changes in efficiency as it gets colder, so users need to factor in different ranges between summer and winter, said Gallagher. If users do the same distance, they will need more energy to charge the vehicle due to higher energy consumption per kilometre driven.