VIEWPOINT Justin Southcombe

Tapping the potential of the intelligent bogie

Remote condition monitoring offers benefits across the industry and opens up the potential to drive efficiency in the supply chain using experience from the aviation sector.

JUSTIN SOUTHCOMBE

Justin Southcombe has been Commercial Director at Perpetuum Ltd since April 2014. Prior to joining Perpetuum, he was Strategy Director for the rolling stock services business at Alstom Transport, where he launched the TrainTracer remote condition monitoring system. He is also a STEM ambassador working with UK schools to support Science, Technology, Engineering and Mathematics. He holds a degree in mechanical engineering from the University of Surrey and an MBA from INSEAD.

We have now reached the point where a bogie can be truly 'intelligent', collecting and instantly sending data about its condition to a maintenance centre. This can be used to predict failures and improve asset management, meaning less time out of service. In this way operators can drive down maintenance costs and drive up train availability — in some cases a 60% increase in bogie mileage has been achieved. As the technology advances, we can observe how products like bogies and wheelsets work as a system rather than as separate components.

Vibration condition monitoring can be used on bearings, motors and gearboxes and even to monitor track condition through the wheel-rail interface — after 12 months of development work in the UK with Network Rail, Perpetuum is assisting the infrastructure manager to analyse the state of tracks in southeast England. This is achieved by collecting vibration data from thousands of wheelsets on over 600 EMU cars operated by Southeastern, allowing Perpetuum to monitor over 1·8 million data points per day. More than 1 billion km of operations using no less than 5 000 sensors have been monitored, allowing significant statistical models to be produced. The data is being used to develop life-cycle management processes that enable asset managers across the industry to save cost, improve safety and plan more efficiently.

Under a separate contract, over 100 DMU cars operated by Southern have been fitted with Perpetuum's vibration monitoring equipment, while in Australia Metro Trains Melbourne has begun a pilot scheme to monitor wheels and bearings on its Alstom X'Trapolis trainsets as part of a project to extend rolling stock maintenance intervals using condition monitoring. Similarly, traction motor condition monitoring has been rolled out on a fleet of London Underground trains where the intervals between motor overhauls have been extended.

Transforming the supply chain

It is now possible for an intelligent system to be mounted on every bogie, generating the potential to transform parts of the supply chain, as happened in the aviation industry in the 1990s when there was a fundamental change in the sourcing and purchasing of key products.

Airlines brought pressure to bear on jet engine manufacturers to explain and fully understand why engine performance did not meet the contracted reliability specifications. This led to a 10-year period when engine manufacturers such as Rolls-Royce developed a robust condition-based maintenance strategy. It was not simply a technological achievement, but a commercial triumph too, and the change became known as 'servitisation'.

Rolls-Royce subsequently adopted servitisation as its business model, and today it advertises 65% of its business around after-sales service and maintenance using the slogan 'power-by-the-hour'. Looking back, it can be seen as a transformation that aligned the interests of manufacturer and clients more closely, and it was inevitable that Tier One suppliers like Airbus and Boeing would follow suit.

Procurement moved away from its primary focus on new build engines, and the interest of engine manufacturers now lies in the business of keeping jets in the sky. The servitisation model drives and rewards performance that can be easily measured in terms of passenger totals, engine hours, servicing intervals and efficiency targets. Much of the information that has enabled this model to be successfully deployed comes from the condition monitoring of jet engines that was carried out in the 1990s.

There is an opportunity for the rail industry to learn from the service-oriented model. The ability to utilise condition monitoring technology to save cost and create 'intelligent' products is within reach, but it is a transformation which will take understanding and coherence from suppliers and clients within our supply chain.

It really needs to happen, as a perfect storm may be on the horizon because rising demand and higher costs are being compounded by a shortage of skilled personnel. For instance, the UK's Rail Supply Group predicts that rail travel will increase by 20% by 2020. Transport for London is also pursuing 24 h operations, pushing up train availability requirements. At the same time, the industry is not replacing skilled staff as quickly as they are leaving, and there are suggestions that there will be an unfilled vacancy in 35% of all rolling stock traction maintenance jobs by 2020.

There is also a huge amount of cost and waste. Looking specifically at wheelsets and bogies, the global industry spends about £8bn every year replacing wheelset and bogie components mainly using hard-time maintenance cycles. As with many railway products, a bogie is still considered or purchased by its constituent products, and that needs to change.

In terms of making smarter use of condition monitoring technology, wheelsets and bogies are a good place to start as rotating metal components provide robust data sets of early degradation through vibration. As 'intelligent' bogies are adopted more widely, the data collected at the component level can be used to save costs and keep rolling stock rolling for longer. Technology will soon enable us to see the bogie as a truly integrated system rather than as a set of gearboxes, motors, brakes and wheelsets. ■

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