**Real-time onboard monitoring of train wheels and axle bearing condition**

Premature failure of rail axle bearings causes a significant increase in train operating costs and can impact on train safety. Rail axle bearings have an anticipated service life; some bearings do not achieve this however, and other bearings could run for longer periods.

A new on-board condition monitoring approach provided by Perpetuum Ltd is now employed on Southeastern trains to provide the operator with real-time information about the bearing health. Each bearing is monitored using a wireless sensor node (WSN) powered by vibrations and bolted to the wheel bearing housing.

The WSN measures vibrations (1 kHz) using a tri-axial accelerometer; the data are processed and wirelessly sent to the cloud to be available in real time. This new technology has made detection of early bearing damage possible.

Collaboration with the University of Southampton has provided resources to inspect the failed bearings and to establish a correlation between the bearing damage and the corresponding vibration signature. Recent work has shown that the system can also detect subsurface damage to wheels and wheel flats.

This new technology allows the operator to safely increase service intervals, increasing asset availability and reducing maintenance costs. At the same time, the operator can continuously monitor the bearing and wheel health and will be able to schedule a programmed maintenance plan.