



Transmission Dynamics®

Revolutionising Rail with Advanced Condition Monitoring

In an era where the global rail industry faces the pressing need for enhanced service reliability, reduced operational and maintenance costs and improved safety, Transmission Dynamics has stepped in to redefine the status quo.

This UK-based, multi-award-winning company, renowned for its expertise in bespoke sensor development and Industrial Internet of Things (IIoT) solutions, has developed a range of proprietary technologies that revolutionise railway asset and infrastructure monitoring through advanced train-borne sensor technology. Their aptly named Trains with Brains® solutions offer continuous monitoring and reporting capabilities that mitigate numerous industry challenges.

PANDAS-V®: Pioneering Pantograph and Overhead Line Monitoring

At the heart of Transmission Dynamics' innovations lies PANDAS-V®, a groundbreaking system combining advanced IIoT sensor technology with a unique design. This system features a roof-mounted camera synchronised with a pantograph-mounted wireless accelerometer, detecting changes in overhead line conditions during routine operation. With real-time onboard processing, PANDAS-V® utilises advanced AI protocols to take critical measurements and capture 10-second video clips of potential issues, pinpointing and instantly reporting them to relevant stakeholders.

PANDAS-V® has proven effective in preventing serious issues and reducing maintenance costs for

infrastructure maintainers globally. Michael Dobbs, Principal Engineer at Network Rail, praises PANDAS-V® for its critical role in identifying problematic locations, stating, *"The PANDAS-V® system could have prevented more than £5.9m worth of costs over the last 5 years on the Class 350 trains alone."*

Since the system's release in 2021, the combined fleet of PANDAS-V® cameras has automatically deployed 7 million reports with practically zero no-fault finds, making an unparalleled contribution to the improvement of the OLE infrastructure. Case study highlights include:

- **De-wirement Prevention:** PANDAS-V® preempted a potential de-wirement caused by the fast deterioration of tension in a cross strainer wire, generating alerts hours before the issue could escalate.
- **Contact Wire Fatigue Detection:** PANDAS-V® identified a contact wire fatigue failure, registering regular alerts and highlighting the need for proactive maintenance to prevent a severe incident.
- **Fault Detection:** PANDAS-V® detected repeatable impacts at a specific location, causing chipping of the carbon strip of the pantograph. *The client stated, "Subtle faults like this one are very difficult to find. Without PANDAS-V® it would be like trying to find a needle in a haystack."*
- **Catenary and Insulator Damage Prevention:** Significant damage was prevented when PANDAS-V® reported this impact and Oliver Corfield, Senior Asset Engineer, noted, *"Without this alert, the missing cross contact wouldn't have been reported, potentially leading to a costly de-wirement."*



SmartBugs®: Compact, Comprehensive Monitoring

SmartBugs® are another testament to Transmission Dynamics' innovation. These compact, wireless monitoring systems offer rapid deployment for various critical functions, including wheel flat detection, wheel rolling contact fatigue detection, axle box temperature monitoring, and track quality monitoring. Equipped with edge processing capabilities, SmartBugs® provide actionable insights based on temperature and vibration data, enhancing operational efficiency and asset management.

SmartBugs® ease of installation and reliability make them invaluable for comprehensive asset monitoring. *A client noted, "Early detection of issues will see a move to more proactive, intelligent preventative maintenance rather than reactive measures."* Key case studies:

- **Compressor Monitoring:** One of the UK's largest railway franchises uses SmartBugs® for compressor monitoring. They detected an abnormal rise in operating temperature and duty cycle, indicating a valve leak. Prompt alerts led to timely repairs, restoring performance.
- **Rolling Contact Fatigue Detection:** SmartBugs® regularly detect early rolling contact fatigue, allowing for proactive, intelligent preventative tyre turning instead of relying on mileage-based maintenance, significantly extending wheelset life.
- **Health and Usage Monitoring:** The system autonomously monitors and reports on the operating run-times of various assets, such as diesel engines, air compressors and traction motors.

Smart Oil Plug®: Revolutionising Gearbox Health Monitoring

The Smart Oil Plug® replaces traditional oil filler or drain plugs on railway vehicles to monitor temperature, vibration and ferromagnetic oil debris. This wireless, sensor-based solution offers a holistic view of gearbox health, providing early detection of potential issues like bearing failure and suspension defects. Detection examples include:

- **Wheel Flat Detection:** The Smart Oil Plug® uses the repeatable pattern of acceleration data to identify wheel flats. One client reported that after receiving an alert, the train was taken out of service immediately, and upon examination, flats were reported as 55mm long.
- **Gear Quality Monitoring:** The system revealed vibration levels exceeding the fleet average, prompting client inspection and subsequent repair, averting potential failures and premature drivetrain failure.
- **Shaft Issues:** This technology detects amplitude modulation to indicate potential shaft issues, enabling the scheduling of proactive maintenance.

Transmission Dynamics' Trains with Brains® solutions have demonstrated their transformative potential across the global rail industry. From preventing catastrophic failures to optimising maintenance schedules, these cutting-edge innovations have provided tangible benefits in service reliability, operational efficiency and safety.

To find out more about Transmission Dynamics visit www.transmissiondynamics.com

Revolutionising the global rail sector with unparalleled rail asset and infrastructure intelligence.

These future proof, self-learning IoT solutions are:

- Informing improved maintenance practices
- Reducing delays and costs
- Improving safety and service reliability



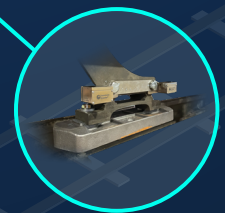
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BoltSense®
Bolt Tension
Monitoring



PANDAS-3R®
Third Rail Monitoring



SmartBugs®
Vibration & Temperature
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