



Transforming Data into Actionable Information

Instrumentel is a world-leading provider of asset monitoring solutions for precision measurement in extreme environments.

Our solutions include Condition-Based Predictive Maintenance, Condition Monitoring of remote assets and predictive analytics to improve asset performance. We also provide Asset Management solutions through the use of RFID and other technologies.

Instrumentel's condition-based maintenance systems are being increasingly adopted by asset owners, operators and maintainers in the Rail, Automotive, Industrial and Defence sectors.

Utilising military grade sensors and existing data feeds on rolling stock or infrastructure and connecting these to Instrumentel's configurable Diagnostic Hub gives remote data available in real-time. The data can be sampled between 10 times per second for temperatures or pressures up to 1 million samples per second for electrical signals.

With over 2,000 condition monitoring systems installed on Rolling Stock worldwide, we can configure the monitoring systems to capture the key information.

Condition Monitoring Capabilities

Instrumentel offers a range of design, build, installation and data science services which use remote condition monitoring to improve the reliability and availability of assets such as Rolling Stock, Infrastructure and Train Control.

Instrumentel's goal is to turn data into **usable, actionable information**. Our team of expert engineers and data scientists work collaboratively with customers to provide early warning of potential failures, allowing action to be taken before the asset fails in service.

Our solutions can also be used to extend the life of assets or the periodicity between planned maintenance, safe in the knowledge the condition of the asset is known in real-time.

Our Sensor Technology is used for monitoring:

- Brake Systems
- Traction Motors
- Door Systems
- Engines
- OTMR harvesting
- EMU/DMU Energy Metering
- HVAC Monitoring
- Track Circuits



We improve the performance of the Rail Industry, saving time, money and carbon emissions.



Sensor Technology

Sensors installed and existing data extracted

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Data Transmission

Secure Transmission in real time

Data is securely captured and stored using our proven hardware. Some edge processing to refine the data is completed to maximise efficiency where appropriate.

Using message queue systems the data is sent in real-time or stored waiting for a network connection. This can be through existing networks or on our own 4G or 5G solutions.

Data is encrypted at rest and in flight, ensuring access is protected. Once the secure transfer of data has been completed and validated, space on the device is utilised for new samples, ensuring ongoing capacity.



Data Storage

Cloud storage and integration

Our proprietary systems are seamlessly linked to provide live updates to our master database and displayed within Paradigm Insight.

Details of assets (including scanned documents and photos) are also stored to show the full life-cycle and allow for ongoing analysis.

This approach has been proven with multiple customers including LUR, where we are tracking wheelsets through the overhaul cycle, giving full asset history via Paradigm Insight and producing bespoke reports to the requirements of our customers.

Data Science

Collaborative analysis identifying real-world impacts

Our team of expert engineers and data scientists work collaboratively with customers to provide early warning of potential failures, allowing action to be taken before the asset fails in service.

Our Data Scientists bring together the harvested data, with environmental and full system data to create a holistic approach that can identify when an asset is failing, or whether it is heat/cold, humidity, human intervention etc that is causing an off-target performance. This avoids focusing the effort on the wrong cause.

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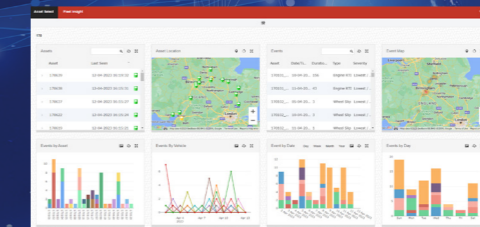


Actionable Information

Paradigm Insight alerts when to take action

The output of the analytics is presented via email or SMS alerts with targeted information available on our web portal Paradigm Insight which is available on any device with an internet connection.

An example of this is shown below.



Performance Improvement

Better decisions improve reliability and availability

Every asset intervention is driven by decision making - both AI and human. The quality of these decisions is based on the quality of the data being used.

At its simplest, this results in periodicity driven maintenance - leading to avoidable costs and wasteful use of resources.

The data that we provide will change the way that you maintain your asset.

Decisions using Paradigm Insight are based on the actual condition, leading to predictive maintenance that targets the cause, rather than the symptom.

Saving you **time, money and carbon emissions.**



Some of our rail partners



A Case Study - Porterbrook

Instrumentel was asked to design, install and support a remote condition monitoring solution to provide a number of priority signals and extract the data required, correlate it with GPS data and turn it into actionable information that was required to move towards a more predictive form of maintenance for the fleet.

Data Analytics

The fleet of vehicles were installed with Instrumentel's equipment allowing real-time access to a wealth of data for each vehicle. The data is displayed on Instrumentel's web portal Paradigm Insight which is available on any device with an internet connection. The monitoring equipment provides usable, actionable information to allow targeted maintenance of vehicles resulting in:

- Improved vehicle reliability and availability
- Reduced maintenance time for diagnostics
- Real-time location of key assets
- The move to a Condition Based Maintenance regime

Data is securely transferred from the vehicles to our servers using end to end encryption via VPN.

All signals are analysed for any variance to their normal behaviour and alerts are notified to Porterbrook and Cross Country via email, with further analysis available using Paradigm Insight.

"Instrumentel has worked flexibly to supply and support the RCM equipment on the CrossCountry fleet, adapting the solution to meet our needs. Together as partners we are advancing the use of remote monitoring solutions to reduce failures and improve the maintainability of the Turbostars. This is delivering immediate benefits for CrossCountry and through the long-term partnership we have, the benefits will continue to grow."

Stephanie Klecha, Head of Digital Services, Porterbrook

In Japan and Australia, Instrumentel is represented by

Unipart Rail Australia

Unit 1, 52 Holker Street,

Silverwater,

NSW, 2128

Phone :+61 (2) 8787 5910

email: uga.enquiries@unipart.com