SmartVision™ Track Condition Monitoring

Developed in collaboration with VR FleetCare

Real-Time Continuous Monitoring of Tracks and Track Assets from In-service Trains

EKE

Monitor | Identify | Manage

Real-Time Continuous Monitoring of Tracks and Track Assets from In-service Trains

EKE-Electronics, in collaboration with VR FleetCare, have developed a unique solution that uses sensor data from in-service rolling stock to provide real-time continuous monitoring of the condition of track and track assets.

SmartVision™ Track Condition Monitoring measures the smoothness of ride experienced by a normal in-service train passing in full load and with full speed over the track. These frequent measurements complement less frequently produced track geometry measurements from measurement trains. Sudden and quickly developing problems, such as broken rails or damage caused by wheel slip are detected. Early detection can result in cheaper cost of repair and reduces the risk of secondary damage.

A key enabler for the condition monitoring of track assets is the SmartVision™ Rail Asset Database. This records the type and location of track assets so that the degradation of the asset's condition can be followed. The user receives notifications of critical changes so that the correct action can be taken in the correct location at the correct time.

Field validation tests have been performed with our collaboration partner, VR FleetCare, to locate track irregularities, detect faulty insulation joints, monitor switch health and identify hunting.

We have an open data policy, giving you access to the measured data via the SmartVision™ user interface.

In order to benefit from Track Condition Monitoring, the measuring system needs to be installed on a selected number of in-service trains. EKE can support with the process to approach the train operator and help with installation planning and approvals with the support of VR FleetCare.

Added Value from SmartVision™ Track Condition Monitoring

Increase line availability by reacting quickly to SmartVision™ warnings about sudden and quickly developing problems, such as wheel slips and squats.

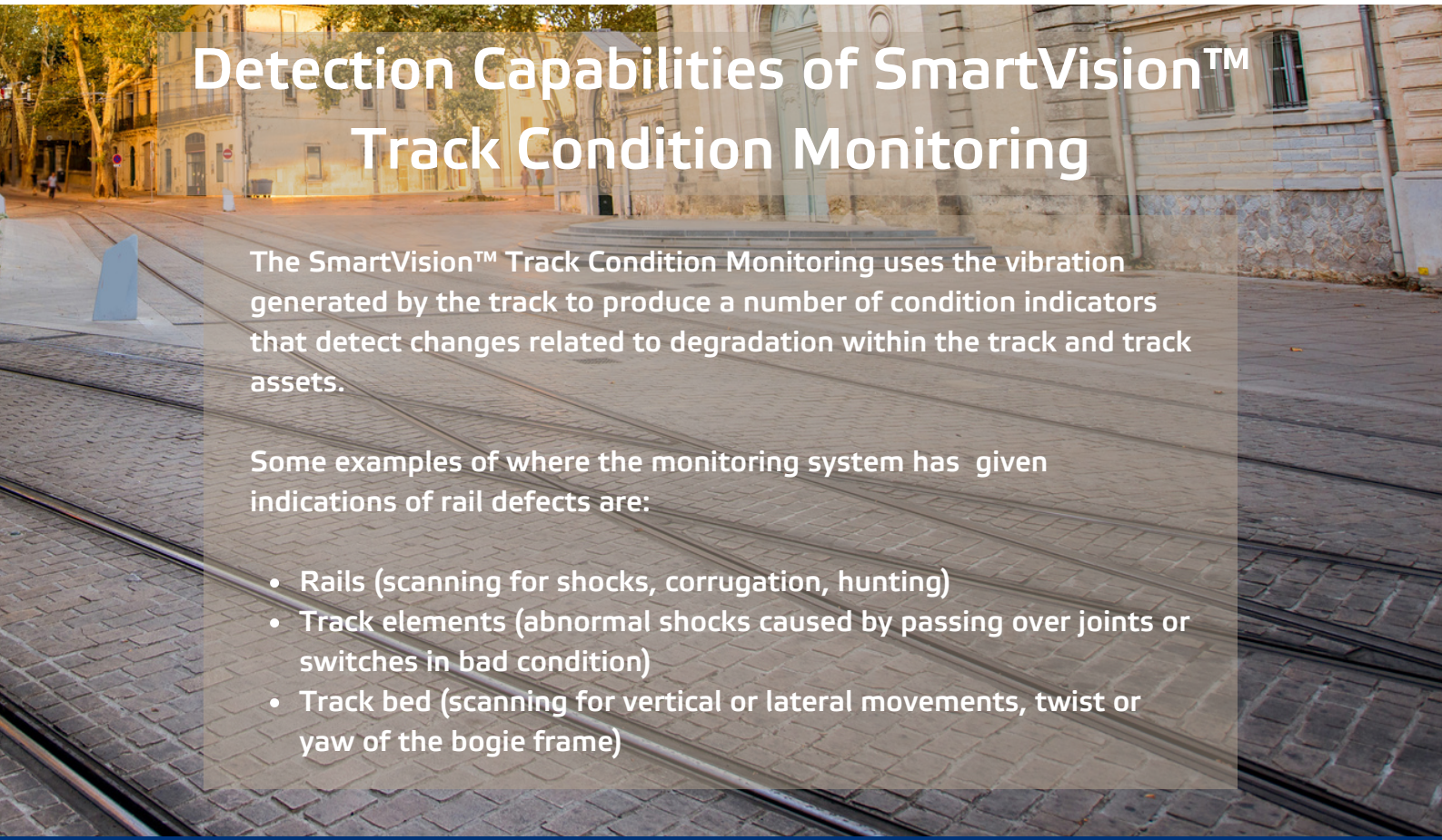
Improve safety by using frequent measurements about track asset condition to complement less frequent track geometry measurements and identify critical faults such as broken rails.

Efficient maintenance management by transitioning to condition-based maintenance.

Make cost savings by enabling repair to faults before secondary damage is caused to the track or wheels.

Optimise asset life by following the condition of track assets to maintain based on the real need instead of repairing once broken or servicing based on schedules.

Easily assess the condition of your track assets instead of analysing curves with masses of measurement results.



Detection Capabilities of SmartVision™ Track Condition Monitoring

The SmartVision™ Track Condition Monitoring uses the vibration generated by the track to produce a number of condition indicators that detect changes related to degradation within the track and track assets.

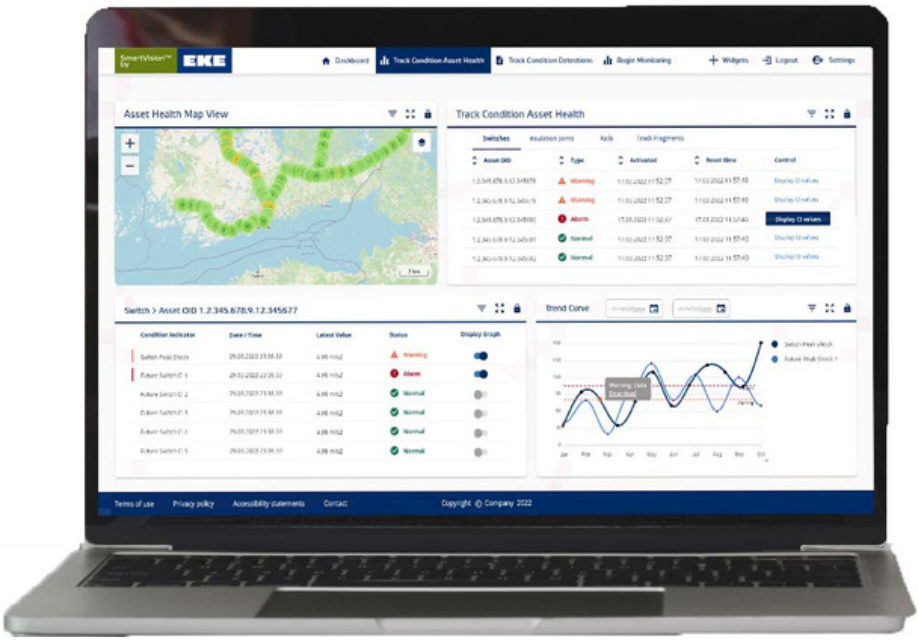
Some examples of where the monitoring system has given indications of rail defects are:

- **Rails (scanning for shocks, corrugation, hunting)**
- **Track elements (abnormal shocks caused by passing over joints or switches in bad condition)**
- **Track bed (scanning for vertical or lateral movements, twist or yaw of the bogie frame)**

User Friendly Visualisation

SmartVision™ Track Condition Monitoring's easy-to-use web-based user interface turns data into actionable information to make informed business decision about when to perform maintenance based on the condition of your track and track assets. Our system allows you to view the status of your whole network in one place.

SmartVision™ Track Condition Monitoring increases line availability, helps avoid unexpected faults and enables transition towards condition-based maintenance.



Our open data policy gives you access to the measured data via the SmartVision™ user interface. Users can download this data to enable further analysis using their own tools.

SmartVision™ is accessible via a standard web browser. EKE recommends performing user authentication via integration into the operator's single sign-on environment.

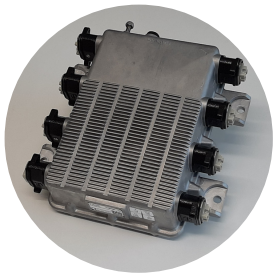
Smartvision™ Rail Asset Database

The SmartVision™ Rail Asset Database is a key enabler for the condition monitoring of track assets. This records the type and location of track assets so that the degradation of the asset's condition can be followed. The user receives notifications of critical changes so that the correct action can be taken in the correct location at the correct time.

The information required for the SmartVision™ Rail Asset Database can be taken from either:

- your existing databases.
- self-learning using a combination of AI (artificial intelligence) and expert knowledge.

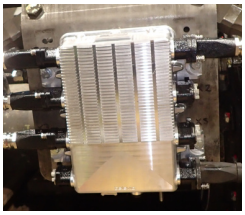
Onboard Data Acquisition



Data collection is performed by Televic Rail's industry leading COSAMIRA sensor gateway, equipped with signal processing software developed by EKE. It contains a central configurable processing and storage unit, and inertial measurement sensors.

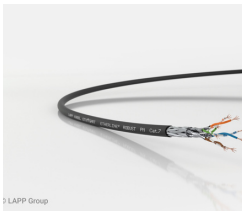
The sensor gateway is installed on one bogie and performs continuous measurement of the track and movements of the bogie. It sends data of detected anomalies, as well as from defined track elements, to the SmartVision™ cloud via wireless data transmission for further analysis.

The SmartVision™ Track Condition Monitoring system is made up of a standard configuration of:



Sensor Gateway

Sensors



Cabling

Router

Antenna

Access is required to a power supply (24/110 VDC). The optimal number of installations is dependent upon several factors such as train schedules, typical faults etc. Support can be provided for planning and installation.

No GPS? No Problem

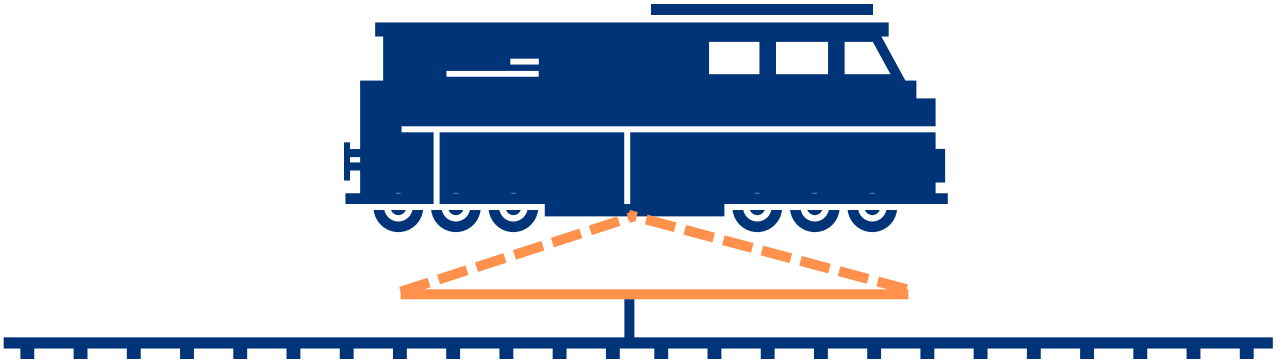
We have a number of underground positioning solutions available.

- Soft Odometer. Algorithmic solution developed by EKE
- Tachometer at axle head
- Other tachometer solution e.g. eddie current or hall effect sensors
- Integration with Train Control and Management System (TCMS)
- Beacon–based positioning

Measurement Train

A measurement train inspects the track geometry by measuring how much the track deviates at the mid-point of a 10, 5, 3 or 1 m long laser beam.

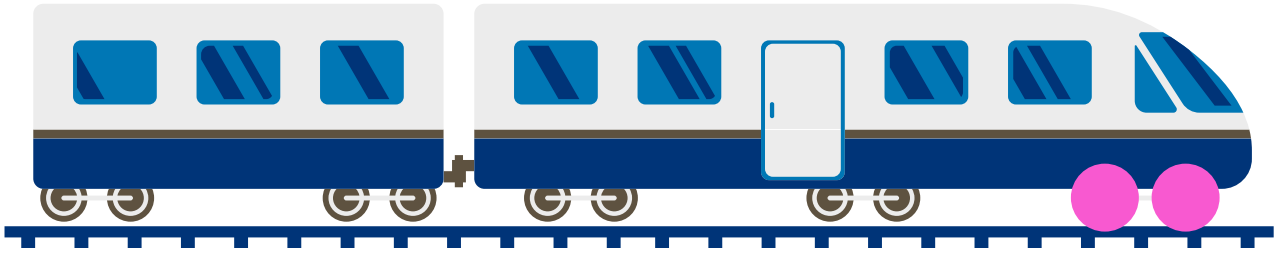
Measurements are taken every 25 cm.



The measurement train focuses on geometry deviations which can cause safety risks or affect passenger comfort

SmartVision™

SmartVision™ measures continuously and with a very high sampling rate the vibration caused by the wheels running over the rail.

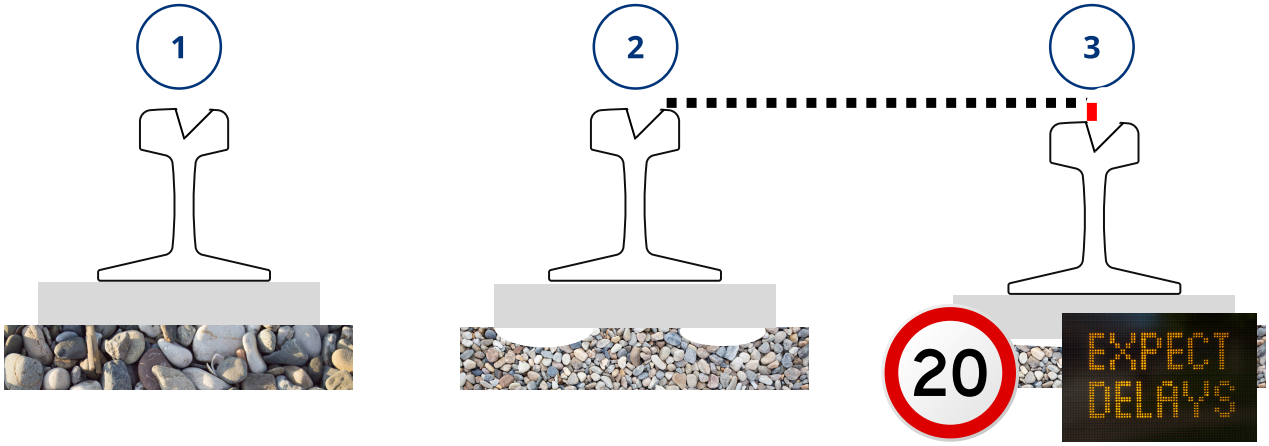


Vibration sensors attached to the axle bearing of each wheel for one bogie

SmartVision™ focuses on measuring the condition of the track for maintenance optimization purposes

The Importance of Early Detection and Repair

SmartVision™ detects faults on the rail early to reduce the risk of secondary damage caused by railhead damage, thereby avoiding costly repair and traffic interruption.



Measurement Train		SmartVision™
Local railhead damage is invisible to the measurement train	1	SmartVision™ detects railhead damages, which can easily be fixed by build-up welding.
Damage causes the train to “hammer” the rail gradually causing secondary damage to the supporting structure	2	Secondary damages are avoided by early repair.
The track geometry measurement train detects the fault only now through height deviation.	3	Costly repair and traffic interruptions are avoided.

Detecting Defects

SmartVision™ can detect:

- Small local defects on the rail surface (railhead) e.g. squats caused by rolling contact fatigue, cracks or wheel slip damages as well as corrugation.
- The need for grinding of the rails and to verify the results of the grinding.
- Hunting of the bogie causing the train to oscillate laterally.

Rolling Contact Fatigue

This small rolling contact fatigue defect on a switch caused a shock of 145g which was detected by SmartVision™ . This can be easily repaired by build up welding.

Wheel slip damage

These old wheel slip spots were observed by SmartVision™. The measurement train had just started to see height deviation changes.

The cracks in the snow indicate loose support of the sleeper.

smartvision@eke.fi

smartvision.fi

+358 9 613030

Follow Us

V2.0.