

eRDM

DYNAMIC RAILWAY DIAGNOSTIC SYSTEM

Your partner in SAFE and EFFICIENT railway transportation

ABOUT EVOPRO

evopro group is an international engineering company that provides comprehensive engineering services and develops innovative products in various industries worldwide, with a focus on transportation technologies, energy and industrial automation.



MISSION & SOLUTIONS

evopro has created state-of-the-art and cost-effective solutions to help the stakeholders of the railway transportation ecosystem overcome the challenges of providing safe and efficient transportation.

Integrating the most advanced measurement and telecommunication technologies, evopro offers its **Railway Diagnostic** product line, including the **eRDM – Dynamic Railway Diagnostic System**.

INCREASED SAFETY	Detection and alarm on derailment-hazardous (dangerous) dynamic load conditions of the passing trains.
OPERATING COST REDUCTION	Detection, trend-monitoring and alarm on railcar-, and infrastructure-damaging conditions of the passing train that results in: <ul style="list-style-type: none">■ The preservation and lifetime extension of both the infrastructure and the rolling stocks by reduced and controlled wear and tear.■ Decreased maintenance costs by predictive maintenance based on the provided trend-data.
BUSINESS EFFICIENCY AND PROFITABILITY	<ul style="list-style-type: none">■ Effective traffic management due to adaptive speed limitations, based on the detected dynamic load conditions.■ Increased utilization by predictive maintenance based on the provided trend-monitored data.■ Increased income by selling trend-monitored data for predictive maintenance purposes to other parties of interest.■ Quality-based tolls and payments based on the provided trend-monitored data.■ Real weight-based tolls and payments and real-time checking of the contracted weights with high accuracy and efficiency even at high train speeds.
ENVIRONMENTAL PROTECTION	Controlled noise-, and vibration-emission using defective wheel detection and trend-monitoring.

TRAIN-, AND RAILCAR-WEIGHING

at train speeds of **up to 160 km/h**
with an **accuracy of 2%** (TÜV Certified)

SPEED MEASUREMENT with an **accuracy of 1%**

TEMPERATURE MEASUREMENT (optionally)

DAMAGE & DERAILMENT PREVENTION

Detection, trend-monitoring & alarm of:

Improper loading of axles, bogies- and railcars
(overloading and all kinds of asymmetrical-loadings)

Axle rupture

Bogie suspension defect

Wheel geometry defects (oval, eccentric, flat or polygonal wheels)

For all alarms and warnings multiple-level threshold limits can be set by the Operator.

I N - M O T I O N W E I G H I N G

Using numerical analysis of the dynamic wheel-loads measured by the eRDM system, the static weight of the railcars can be determined with high accuracy. Comparing the measured values with the available freight protocols the eRDM system is able to verify the contracted freight in real-time, and send alert messages when overloading is detected. It also provides an alternative to weighbridges but way more cost-effectively, even at high train speeds.

D E T E C T I O N & D I A G N O S T I C S

The eRDM system is able to detect and diagnose several defects of the passing train. Using trend-monitoring of the bogie-suspension or wheel-geometry conditions over time, it is possible to accomplish the maintenance of the rolling stocks on a predictive basis instead of conventional regular inspections. Predictive maintenance significantly reduces the idle time of the service, thus reduces operational costs and increases utilization.

■ I M P R O P E R W A G O N L O A D I N G S

O V E R L O A D I N G

Overloading may cause derailment hazard, and might be damaging both for the infrastructure and the rolling stocks.

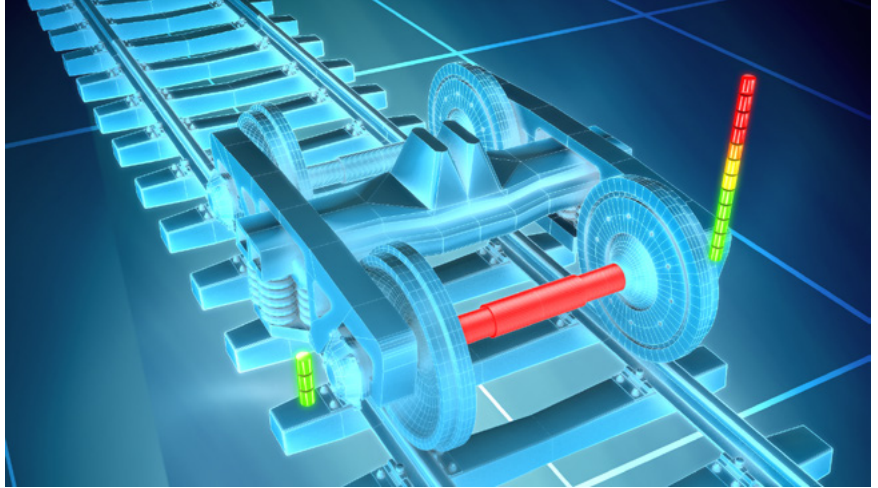
A S Y M M E T R I C L O A D C O N D I T I O N S

Various asymmetrical load conditions of a railcar: left-right, front-rear, twisted wagons, asymmetry within one bogie, etc.



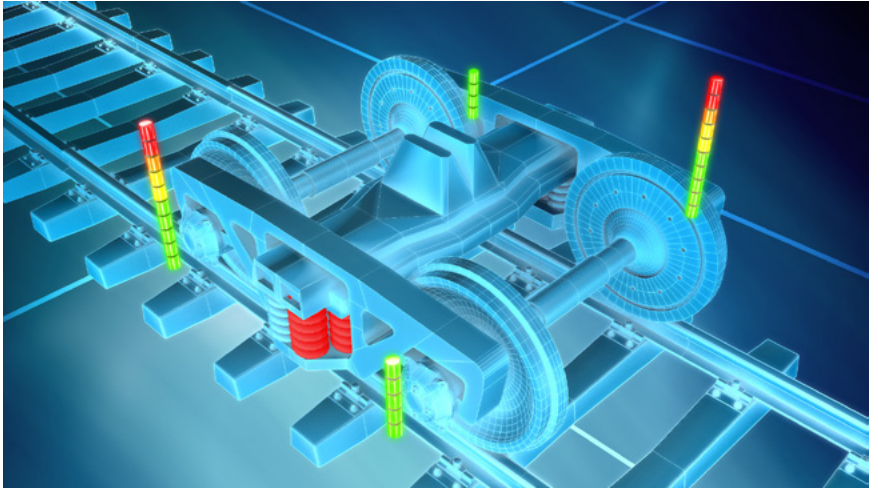
■ AXLE RUPTURE

Running with ruptured axle is one of the most dangerous condition for a train, therefore its detection has fundamental importance in aspect of derailments. Axle rupture typically results in extreme asymmetrical load distribution between the wheels within the damaged axle.



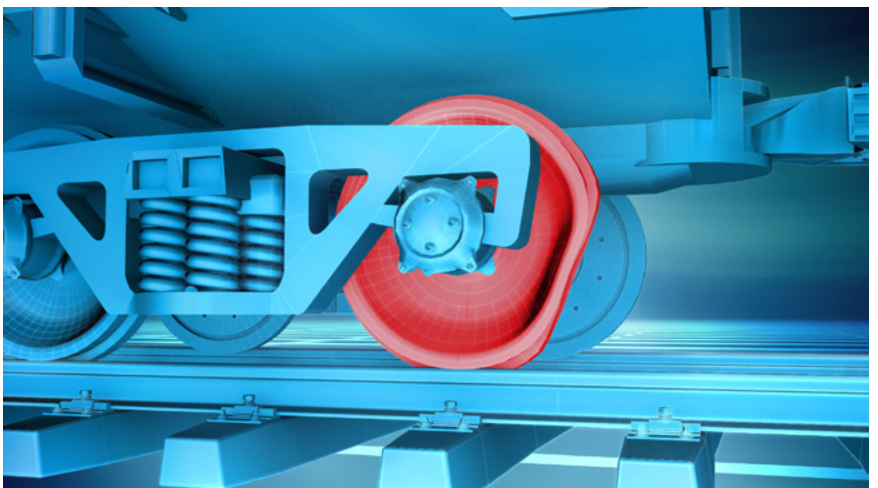
■ BOGIE SUSPENSION DEFECT

The fatigue of the suspension springs of the bogies also pose a derailment hazard as it typically results in an asymmetrical load distribution.



■ DEFECTS IN WHEEL GEOMETRY

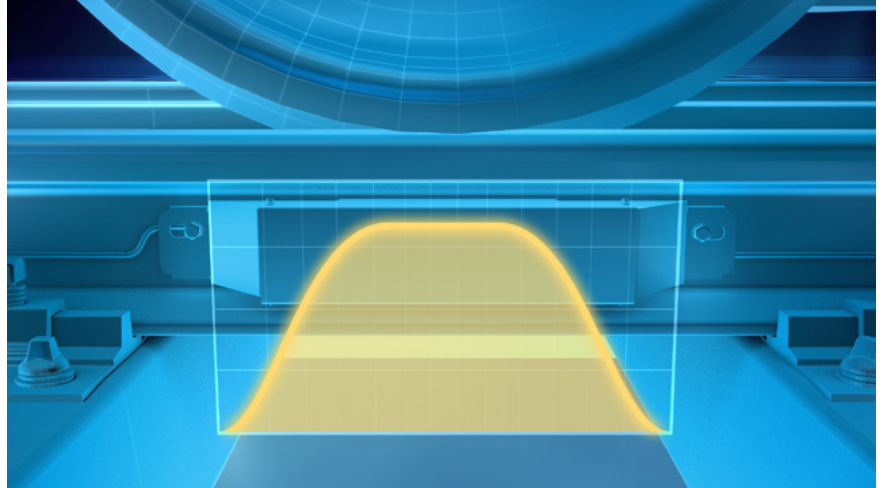
The geometrical deformation of the wheels causes periodic transient extra-loads, which might be damaging both for the infrastructure and for the rolling stock suspension and bearings. The eRDM system records the high resolution load response signal of each wheel and analyses the wheel shape.



SYSTEM DESCRIPTION

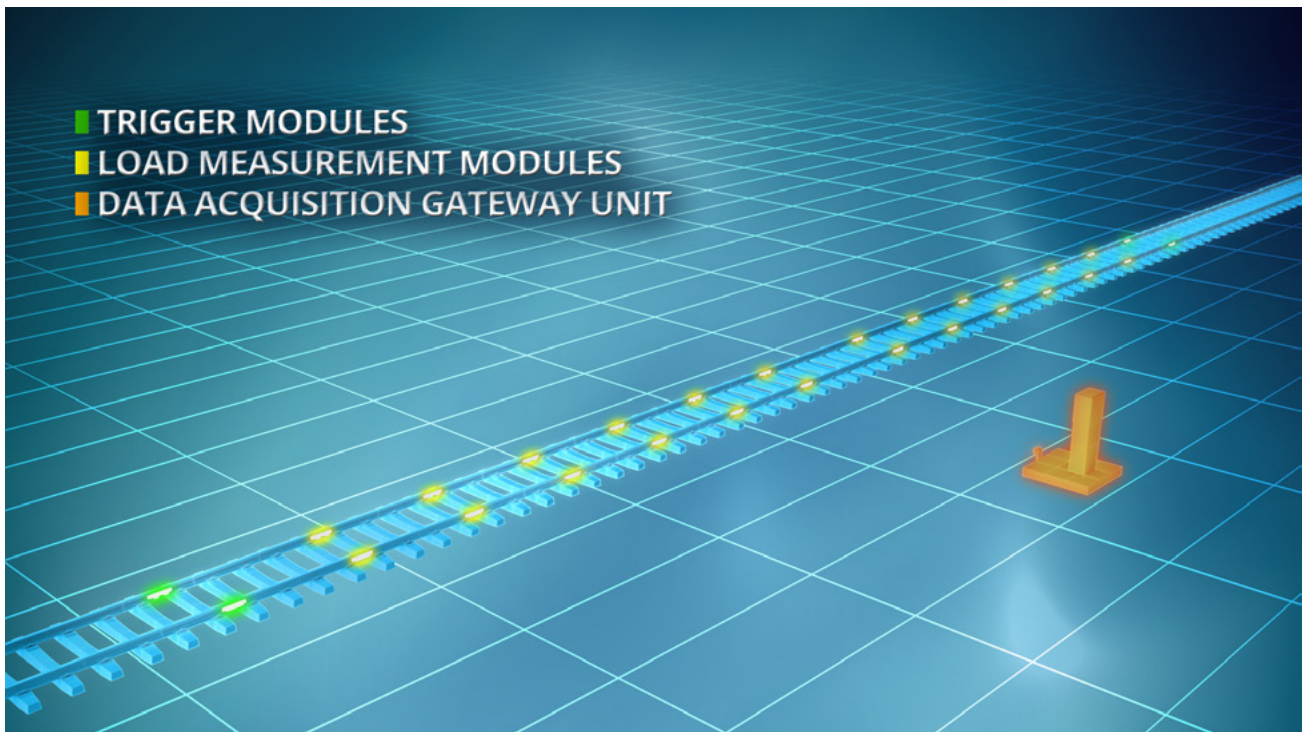
eRDM is a highly integrated wayside digital sensor network system, with high resolution recording of the dynamic load response of each wheel of the passing train.

The dynamic load measurement is based on load measurement modules containing high accuracy, proprietary strain-gauge sensors integrated with high performance digital signal processors.



SYSTEM ARCHITECTURE

The measurement section is composed of 12 pairs of load measurement modules and 2 pairs of train detection trigger modules to start the recording, all mounted on the web of the rail, and interconnected with a high speed digital communication cable.



The measured high resolution load response signals are sent to the data acquisition and communication module located near the measurement section. The module has a battery equipped power supply and a wide area network connection (GSM, GPRS, HSPA, DSL etc.) The system analyses the measured axle-time profile using the offline vehicle database. The data acquisition module can be accessed by local Ethernet or Wi-Fi terminal by service maintenance personnel.



Several wayside eRDM systems can be integrated into a redundant high availability diagnostic server solution. The server collects, stores, processes, and analyses the measurement results and sends the alarm and warning signals to client computers installed in operational stations.

The central system can be accessed by various web browser applications.

■ CALIBRATION & SELF-CALIBRATION

Calibration can be accomplished with wagons measured on high precision weighing systems. The service interface of the eRDM system manages the entire calibration process. The system performs regular self-checking and self-testing functions by comparing the measured and collected offline technical data of locomotives.

SERVICES

evopro offers highly customized turn-key software development services for the integration of the eRDM system central diagnostic server into the IT system of the railway operator for integrated monitoring and alarm functionality.

F E A T U R E S

- Bi-directional measurement and detection
- Automatic and continuous self-calibration function
- Automatic and continuous self-diagnostics with remote maintenance function
- High-reliability with a redundant system architecture (12 pairs of measurement modules)
- Noise-immunity through integrated digital signal processor in each load measurement module
- High resolution load response analysis with proprietary, high bandwidth digital communication
- End-to-end data security of measurement values with state-of-the art secure digital architecture
- Customized software integration into railway operator IT system
- Comprehensive diagnostics from single wheels to full train with automatic alarm functions
- Real-time train identification
- Low power consumption: can be powered from the signaling system; no need for overhead cable supply
- Battery powered UPS for enhanced availability
- Can be installed on most common existing rail systems cost-effectively, no need for special understructure
- Available also as Service on BOO basis

P A R A M E T E R S

Axle load	10 ÷ 400 kN (~ 1 ÷ 40 t)
Weighing accuracy (on wagon basis)	±2 % (TÜV certified)
Vehicle speed	5 ÷ 160 km/h
Speed measurement accuracy	1%
Electric supply	230 (190-250) V; 50/75 Hz
Electric power consumption	max. 150 VA (during measurement)
Operational temperature range	-25°C...+60°C
Length of measuring section	34,2 m (with 600 mm railroadsleeper distance)
Module environmental protection	IP67
Minimal lifetime	10 years
MTBF	10.000 hrs.
Wheelbase	700 mm min.
Wheel diameter	350 – 1250 mm
Rail type (UIC)	48, 49, 54, 60
Railroad sleeper distance	580-650 mm
Internal accumulator capacity	12Ah
Operating time in case of power failure	20 min



it's possible!

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