

# Measurement in and for Railway

THE HBK ECOSYSTEM



PUBLIC

# Organizational Information

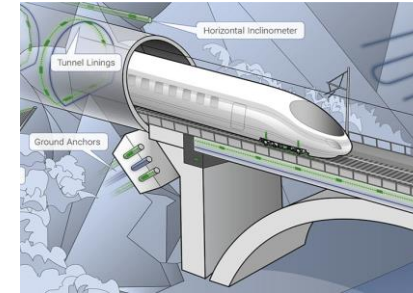
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# Dietmar Maicz

- Railway and Asset Health Measurement Specialist
- Master level degree in Engineering and Economics
- 20 years of experience, >15 years in test and measurement
- E-Mail: [dietmar.maicz@hbkworld.com](mailto:dietmar.maicz@hbkworld.com)





# Railway & Asset Health Measurement

*"The HBK offering is basically complete, covering many applications in lab, bench and mobile testing with centralized data analytics and management. They also have the railway expertise and responsiveness you need when the track is closed for testing and the clock is ticking."*  
DB Systemtechnik



## Our mission

Drive the digital transformation of railway industry by delivering innovation and quality for test and measurement

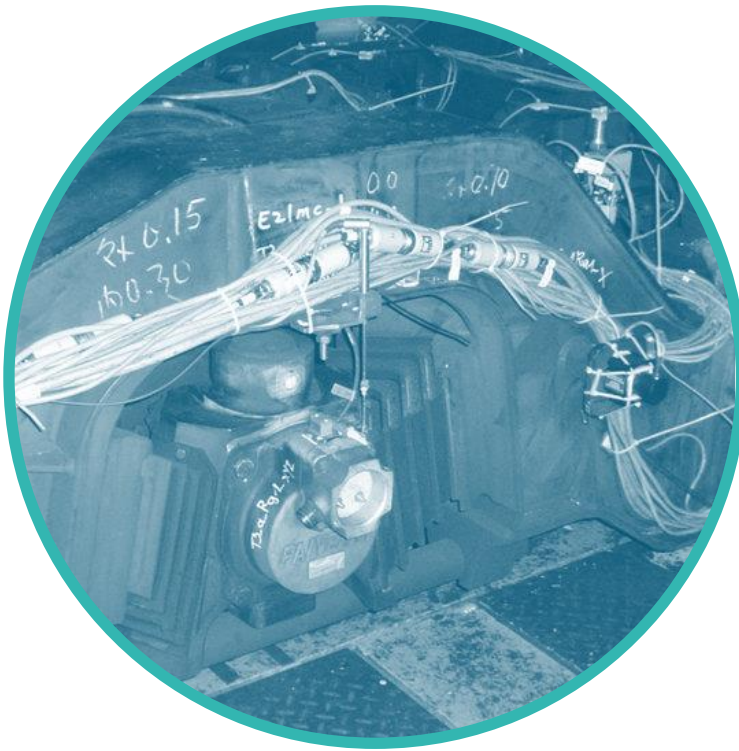


[www.panoramio.com/user/2738746](http://www.panoramio.com/user/2738746)

# We connect physical measurement and digital simulations

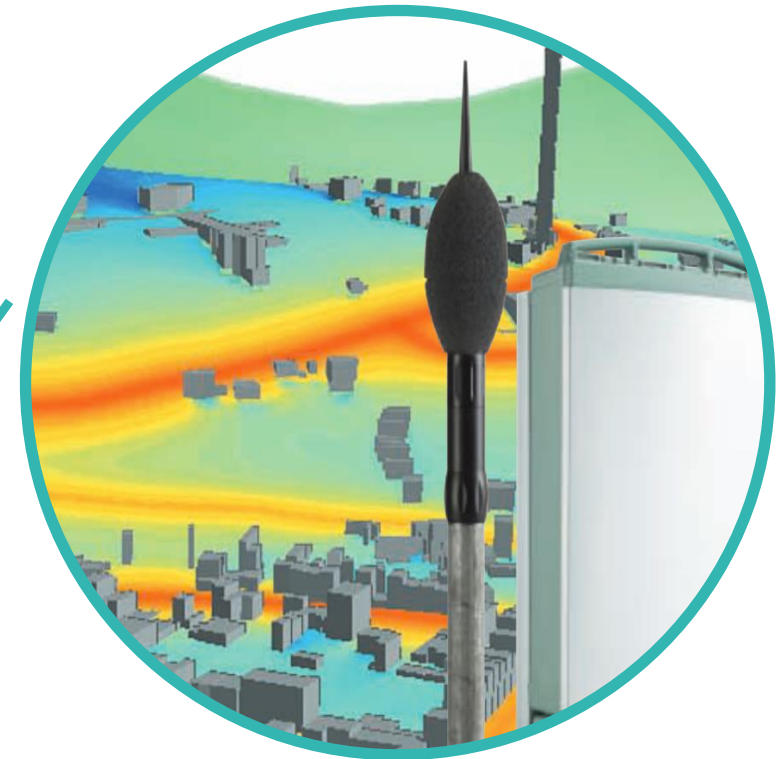
## Test and measurement

Precision instruments and sensors



## Simulation, modelling, control and analysis

Software for data management, analysis and simulation



### SOLVING THE DATA CHALLENGE

- We drive quality data
- We validate output

# As the product physics experts

We deliver valuable insights through three physical domains

## MECHANICAL



### SUB-DOMAINS

- Strain
- Load
- Torque
- Force
- Pressure
- Durability

### EXAMPLES OF OUR TASKS

- Argos® Wayside train measurement, wheel-rail interaction
- Pantograph and overhead force and acceleration
- structural/durability testing
- Vehicle Homologation (all mechanical components)
- Infrastructure measurement (bridge, tunnel, etc)

## SOUND & VIBRATION



### SUB-DOMAINS

- Noise
- Sound quality
- Vibration testing
- Shaker systems
- Sound power
- Acoustics

### EXAMPLES OF OUR TASKS

- Noise quality and reduction – inside/outside
- Evaluating acoustics in new buildings
- Noise mapping: sound intensity, pressure contribution
- Noise source identification and quantification: Bogies, Pantographs, Operation, Infrastructure

## ELECTRICAL



### SUB-DOMAINS

- Electrical signals
- Voltage
- Current
- Speed
- Temperature

### EXAMPLES OF OUR TASKS

- Lightning impulse tests, for example, for testing transformers, surge protectors, isolators and switching systems
- Checking the reliability of power grids
- Determination of current zero-crossing
- Electric power, powertrain testing

# HBK Software solutions – modular and open interfaces

Generate and Acquire Data



Collect and Manage Data



Analyze



Make Decisions and Act



Visualize




Sensors  
Instruments



Data cleansing, validation,  
storage and archiving

Connectors

Maintenance Data  
 XFRACAS

Usage data (time series)  
VePRO Framework



Extract value from the data  
[Engineering & ML]

**nCode**

Engineering & Data Science


**ReliaSoft**


Reliability Strategy and Analysis

Configurable tools



Facilitate decisions and  
take the right actions


 Generate Work Orders


 Create Notifications

 Workflow Engine

Bring data into the hands of  
the right people

 Dashboards

 KPIs and trends

 Automated Reports

3rd Party Systems

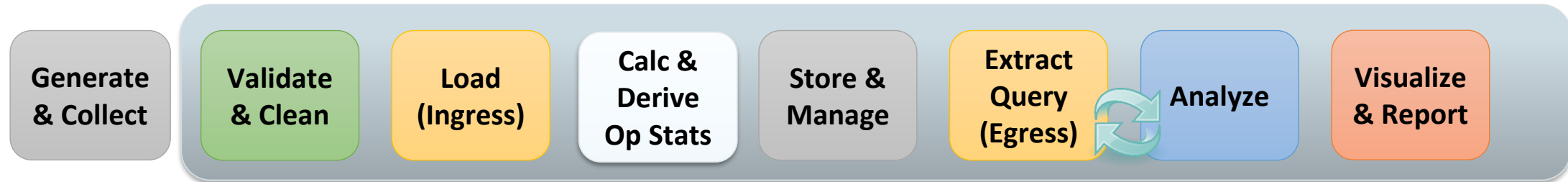




# Technology Landscape

External Data Sources

External Systems



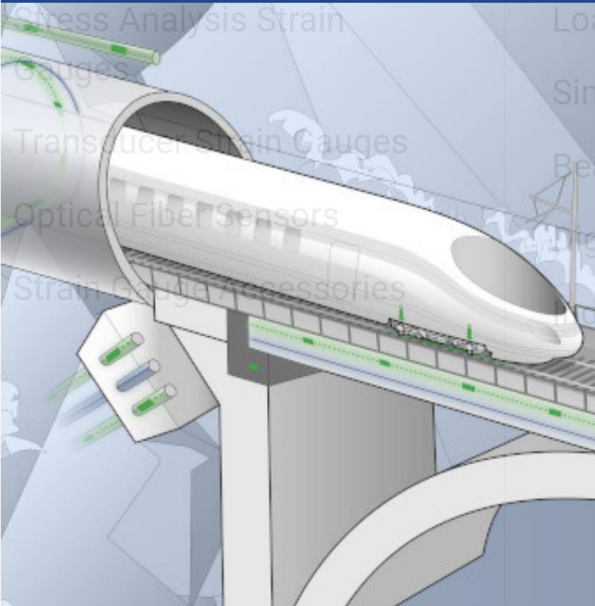
## STRATEGY

- 1) Implement best in class open source solutions
- 2) Integrate leading commercial products where appropriate



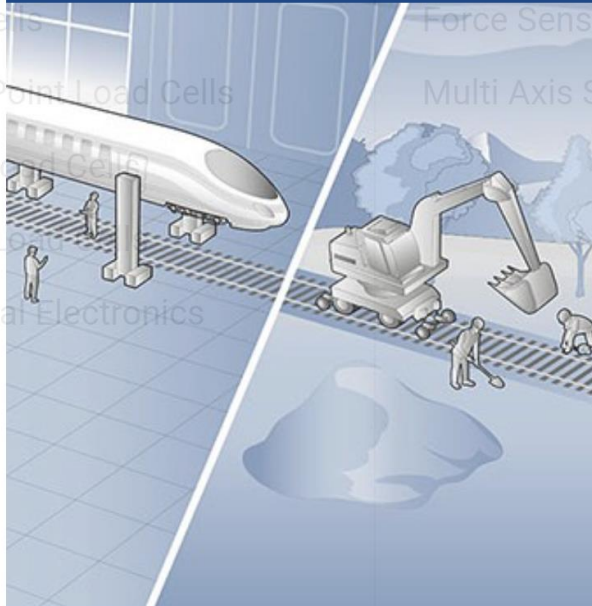
# R&D, Testing, Production, Operation

## Infrastructure



stairways, tunnels, bridges, tracks and overhead-lines in the railway industry, HBK delivers reliable and safe solutions.

## Operation and Maintenance



Prescriptive, predictive and condition-based measurement solutions by HBK ensure safety, cost-efficiency and smooth and easy railway operations.

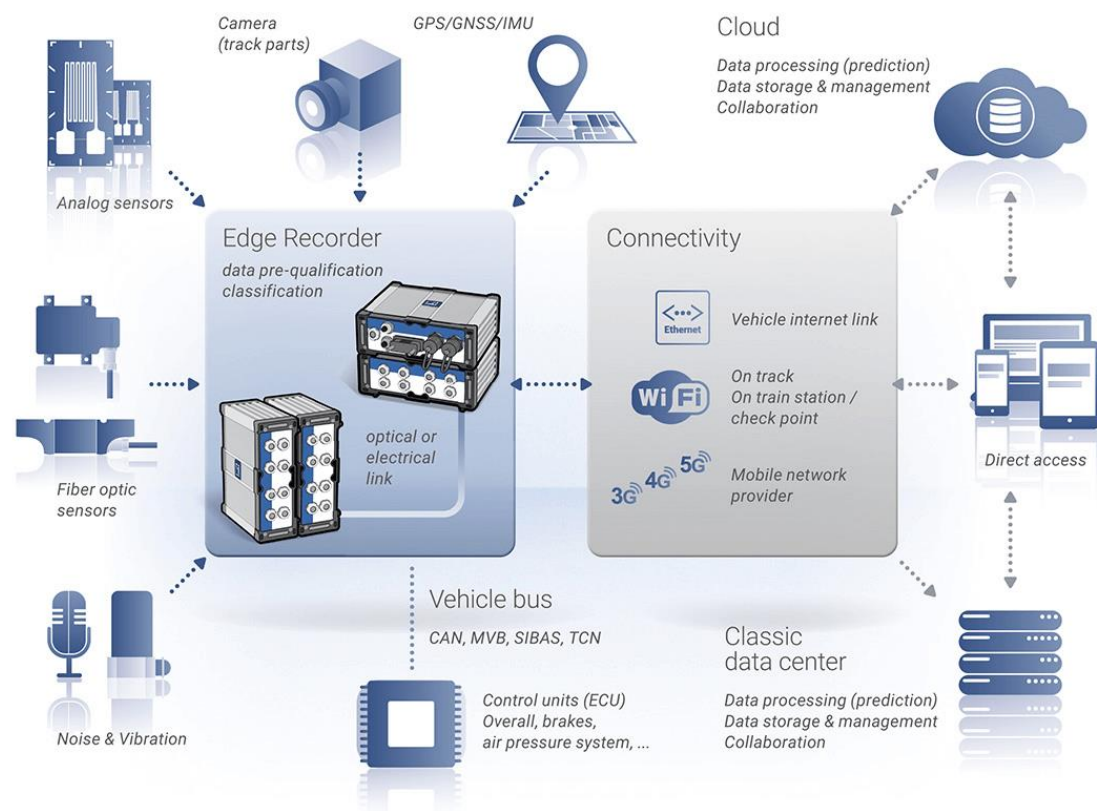
## Railway Testing



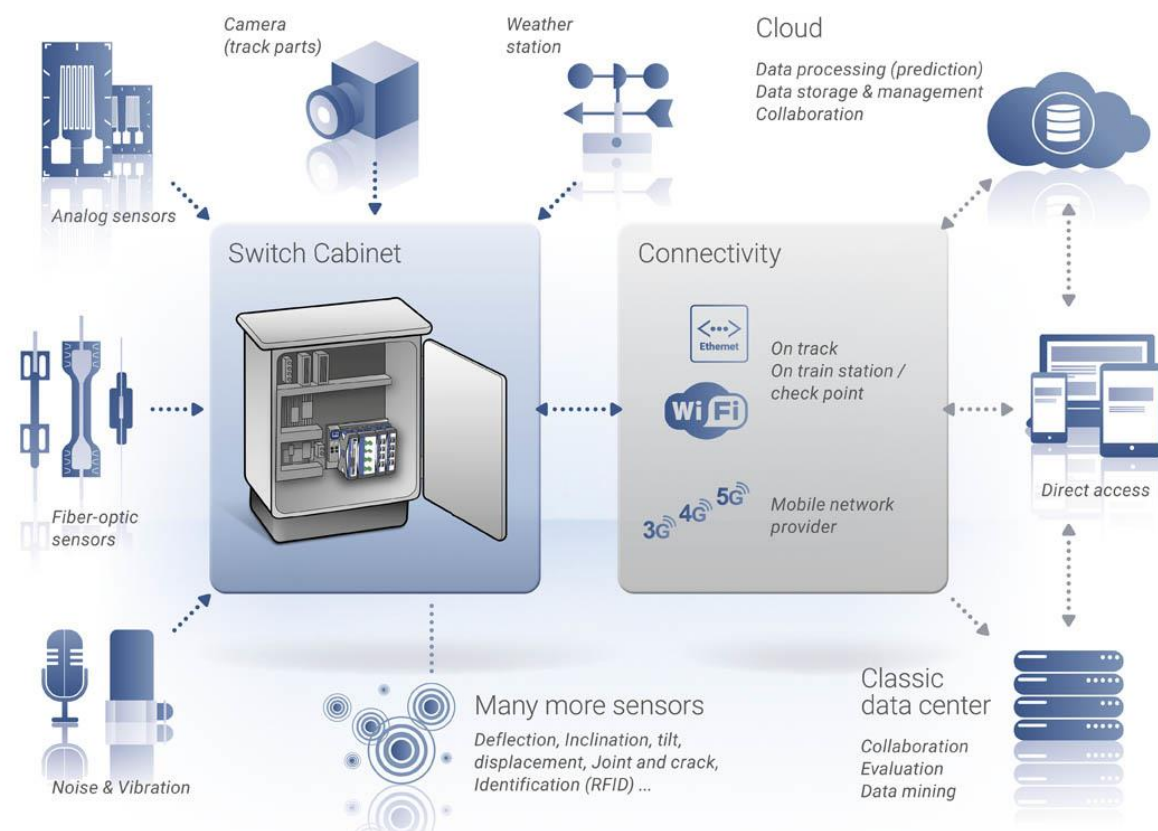
HBK solutions for reliable and solid railway measurement-, test- and analysis results supporting your railway testing on the track and in the lab.

# Modular solution set

## Mobile setup




## Stationary



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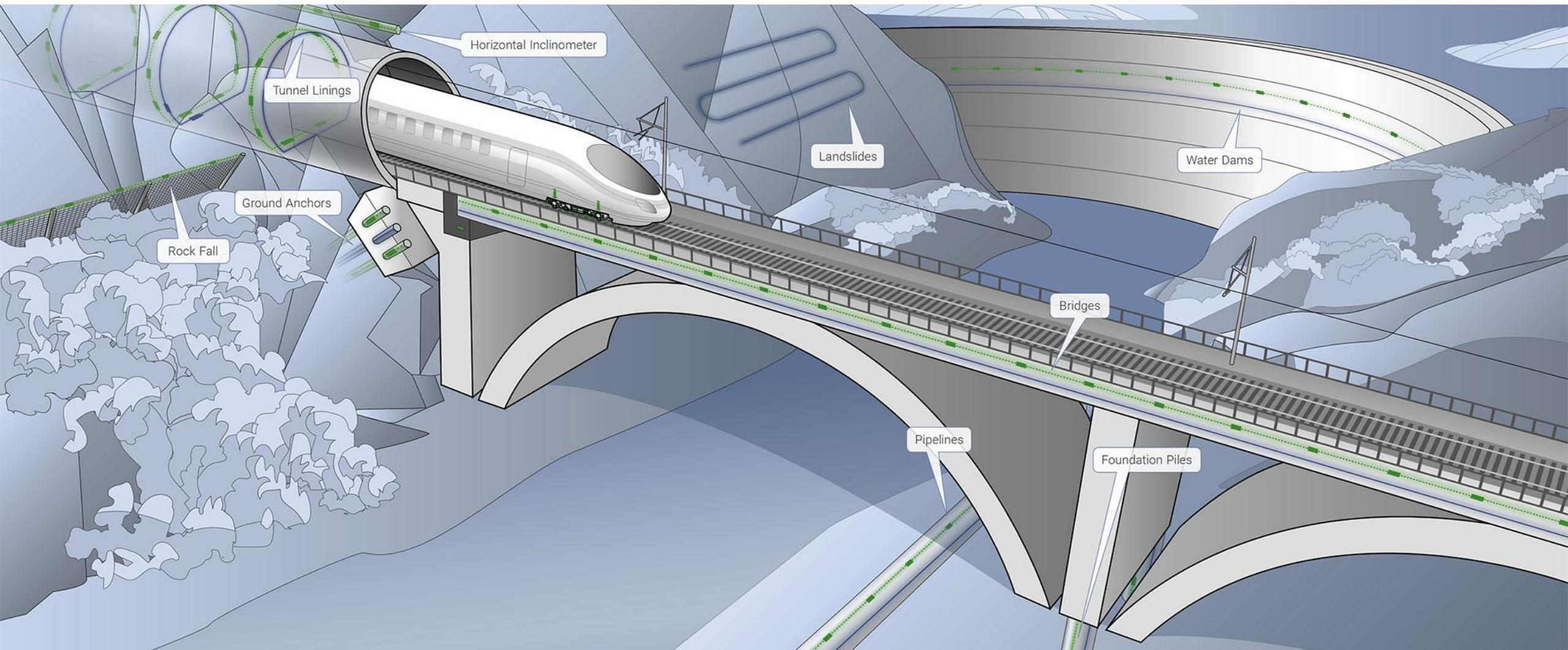
**Railway Testing**



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# Infrastructure: Asset health and new constructions





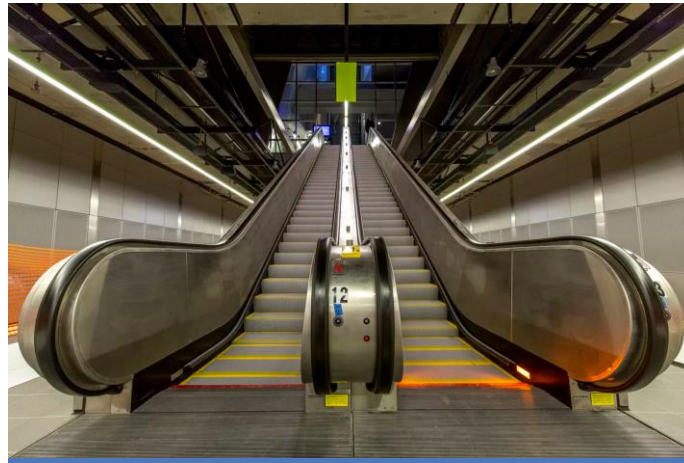




# Infrastructure: Noise and Vibration Measurement and Simulation



Noise mapping



Stair Vibration



Subway Station Ventilation

# Railway Webinar Series

## Join Our Webinar Series – It's Free:

📅 Weekly Sessions in July 2021 ⌚ 4:00 PM (CET) | 10:00 AM (EST) 💬 English

- Measurement in and for Railway - the HBM Ecosystem
- On-board and Wayside Train Measurement: Enabler of Efficient Operations
- **Rail Vehicle Moving Source Beamforming**
- Durability and Reliability Post-processing From Rail Operational Data

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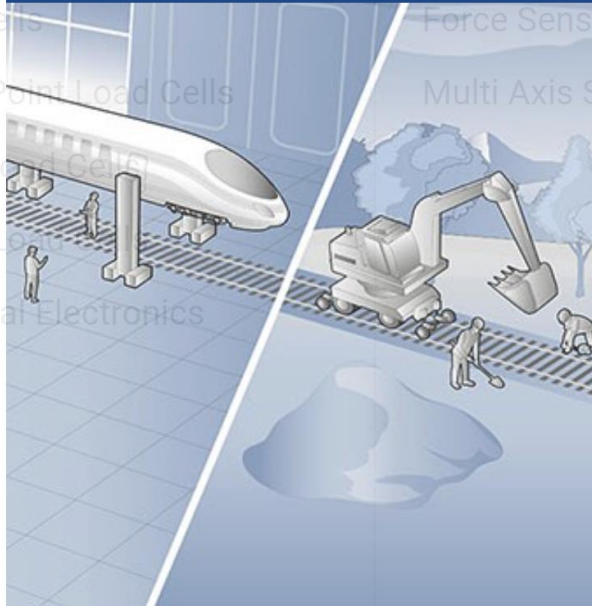
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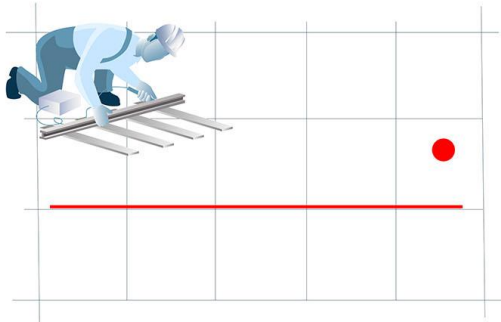


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# Operations, Analysis and Diagnosis, Maintenance and Repairs

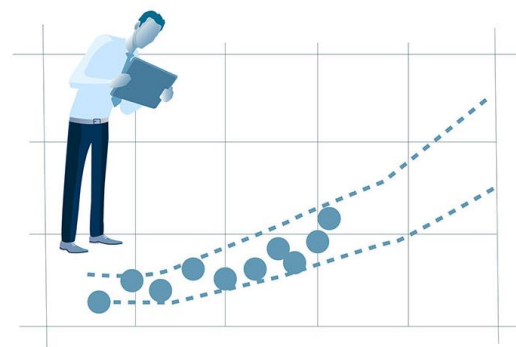
Reactive



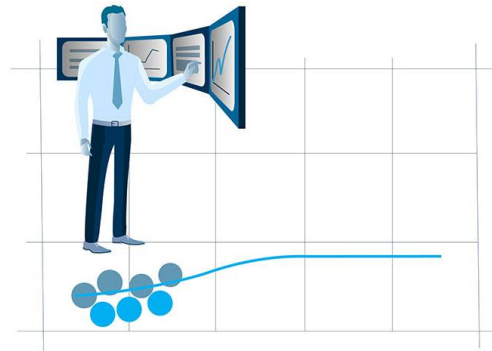
Condition based



Predictive



Prescriptive



Data  
processing  
complexity

Human Input

Reactive

Condition based

Predictive

Prescriptive

Action

1

2

- 1...decision prepared
- 2...automated



# Wayside Train Monitoring

FOR SIMPLE TASKS



# Wayside Train Measurement

PRECISE AND RELIABLE  
MEASUREMENT DATA







# On-board Measurement

PRECISE AND RELIABLE MEASUREMENT




# TSI-SPOT®

SINGLE POINT OF TRUTH

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## Infrastructure



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## Operation and Maintenance



Prescriptive, predictive and condition-based measurement solutions by HBK ensure safety, cost-efficiency and smooth and easy railway operations.

## Railway Testing



HBK solutions for reliable and solid railway measurement-, test- and analysis results supporting your railway testing on the track and in the lab.

# Testing: Lab and Test Bench

## Structural Integrity and Acoustics

- Failure mode and effects analysis (FMEA)
- Fatigue analysis based on FEM/FEA
- Measurement of expansion/mechanical tension, crack propagation, force, relative paths, acceleration
- Fatigue strength testing according EN 12663-1, -2; EN 13749
- Measurement of torsion and torsional oscillation, as well as twist testing
- NVH – noise, vibration harshness measurements
- Acoustic characteristics and noise

## Powertrain Testing and Analysis (Dyno, Electric Power, Battery and Fuel Cell)

### Component Testing

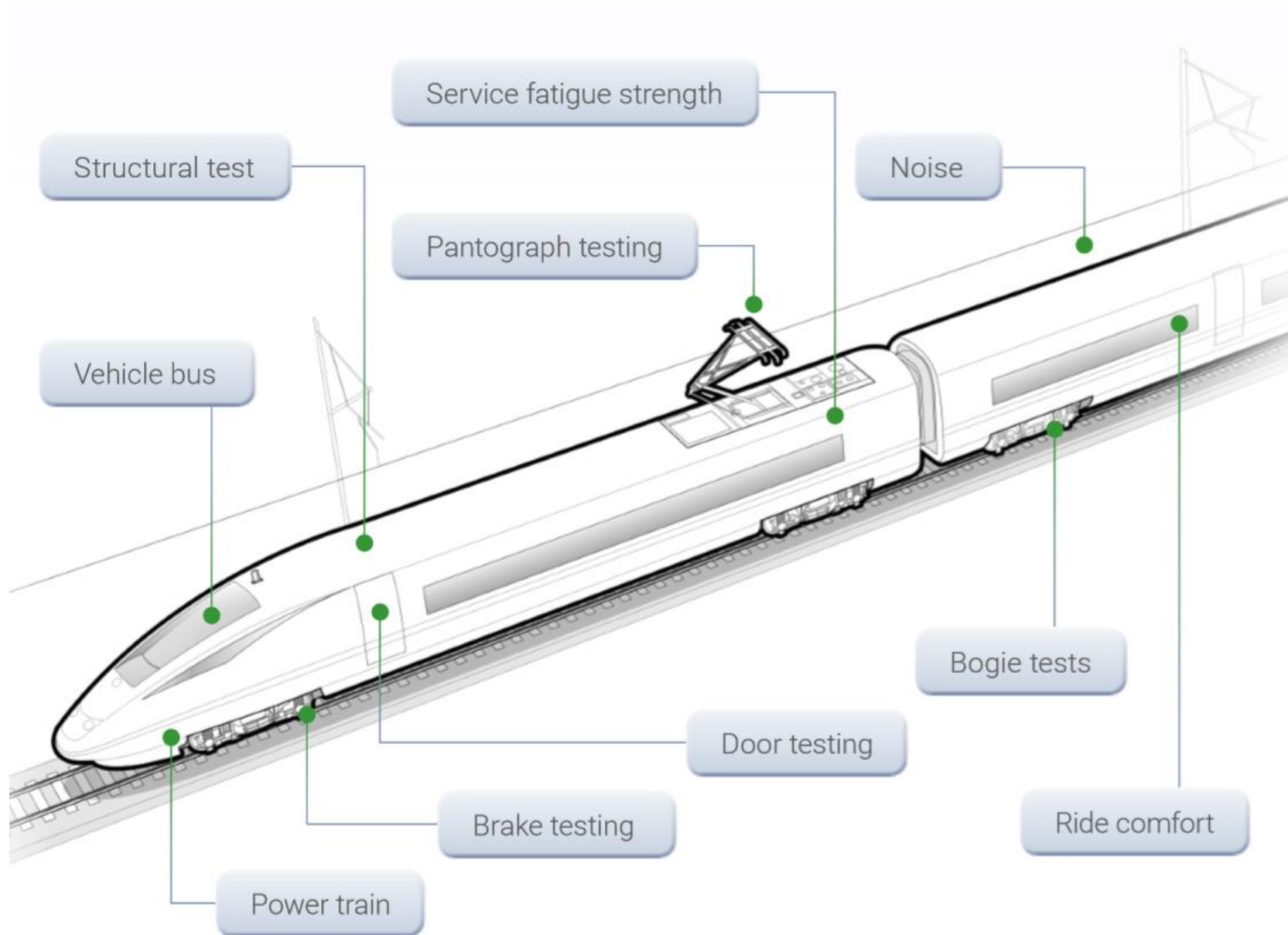
- Pulling and impact direction
- Fatigue strength testing on traction and buffer gears (EN 15551, EN 15566)
- Automatic coupling

### Electrical Analysis

### Troubleshooting



# Testing: Mobile and On-track





# Testing: Mobile and On-track

## Rail Network Testing and Homologation

### Bogie, Truck and Brake Analysis

- Measurement of vehicle comfort
- Determination of the vehicle parameters inclination coefficient, roll pole height, spatial centre of gravity and twist coefficient of the vehicle body
- Testing using measuring wheel sets
- On-track testing of torsion and bending on the wheel set (rolling tests) according to UIC 544-1
- Investigating of the freedom of movement in different track geometries
- Testing of brake control and brake mechanics (including lining or brake pad force measurements) according to EN or UIC
- Slide protection (WSP) tests (UIC 541-05/EN 15595)
- Testing of stopping reliability/break-away force of the parking brakes
- Determination of inclination coefficient and roll pole height
- High-speed testing

## Component Testing: Coupling, Compressors, Generators and more

### Sound and Noise Analysis

- Noise investigation tests/pass-by noise tests with microphone array („acoustic camera“)
- Approval noise tests in accordance with TSI NOI and EN ISO 3095
- Running dynamics and noise approval tests

### Pantograph Testing

### Impact Testing

- Dynamic impact tests on tank containers, MEGCs and flexi tanks
- Derailment safety tests, rail crash tests or impact tests





# Benefits with the HBK Ecosystem

- ▲ With HBK you pull the global product physics experts on board
- ▲ High accurate, reliable sensor data and state of the art software solutions
- ▲ Field proven and reliable system setups to work 24/7
- ▲ Scalable from product to solution for all measurement tasks
  - Products you need: sensors, DAQ + Edge software, server-based data analytics & management
  - All sensors (electrical, optical) and digital signals time sync'd + environmental parameters
  - Turn-key solution if needed: products and services enabling you to get quicker results + training
- ▲ An open Ecosystem ready to integrate anywhere
  - Integrate our sensors or 3rd party sensors, integrate 3rd party protocols, integrated our DAQ into your software, store data in your preferred file format, ...
- ▲ Service available everywhere
  - Trained engineering experts make your project their project
  - Additional Services: product training, programming, metrology / calibration, special sensors, ...

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# Thank You

[dietmar.maicz@hbkworld.com](mailto:dietmar.maicz@hbkworld.com)

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