INTRA INDUSTRIES




EDIFY THE WORLD WITH INNOVATION

RAILWAY ASSET MONITORING & PREDICATIVE MAINTENANCE

Welcome to Intra Industries, your trusted partner in providing innovative and reliable lighting solutions tailored for the diverse needs of the Indian Railways, Metros, Tramways, and Marine Jettys. With our deep understanding of the mobility sector and a commitment to excellence, we specialize in delivering lighting systems that illuminate pathways, enhance safety, and create inviting environments for passengers and operators alike.

RAILWAY ASSET MONITORING AND PREDICTIVE MAINTENANCE

PRIORITIZING SAFETY WITH CUTTING-EDGE SOLUTIONS

At Intra Industries, safety is at the core of everything we do. Our comprehensive range of safety solutions is engineered to meet the stringent standards and regulations of the railway and metro industries, ensuring reliable performance, durability, and compliance with safety protocols.

OUR PRODUCT PORTFOLIO

Live Line Monitoring Gauge

The Live Line Monitoring Gauge with Laser Height and Stagger Measurement System offers precise, real-time measurements of power line height and alignment. Utilizing advanced laser technology, it allows for accurate, contactless assessment of live electrical lines, ensuring safety and regulatory compliance. The system's user-friendly interface and wireless capabilities facilitate seamless data integration and proactive maintenance, helping prevent issues like sagging or misalignment. This technology enhances operational efficiency and supports effective infrastructure management.

Wheel Impact Load Detection System

The Wheel Impact Load Detection System provides critical monitoring of vehicle wheel impacts to prevent damage and enhance safety. Utilizing advanced sensors, this system accurately measures the forces exerted by each wheel, detecting anomalies that could indicate issues like misalignment or excessive wear. The real-time data allows for timely maintenance and adjustments, improving vehicle performance and reducing the risk of costly repairs. This system is essential for maintaining optimal operational efficiency and vehicle longevity.

Hot Axle and Hot Wheel Detection System

The Hot Axle and Hot Wheel Detection System is a high-precision technology designed to monitor and identify overheating components in railway systems. By continuously measuring axle and wheel temperatures, it detects potential failures before they become critical, enhancing safety and reducing maintenance costs. The system uses advanced sensors and real-time data analytics to provide timely alerts, allowing for prompt intervention and minimizing the risk of derailments or equipment damage.

WHY CHOOSE INTRA INDUSTRIES SAFETY SOLUTIONS?

Quality and Reliability
Our safety solutions are built to the highest standards, using quality materials and components, ensuring durability, longevity, and consistent performance in demanding railway and metro environments.

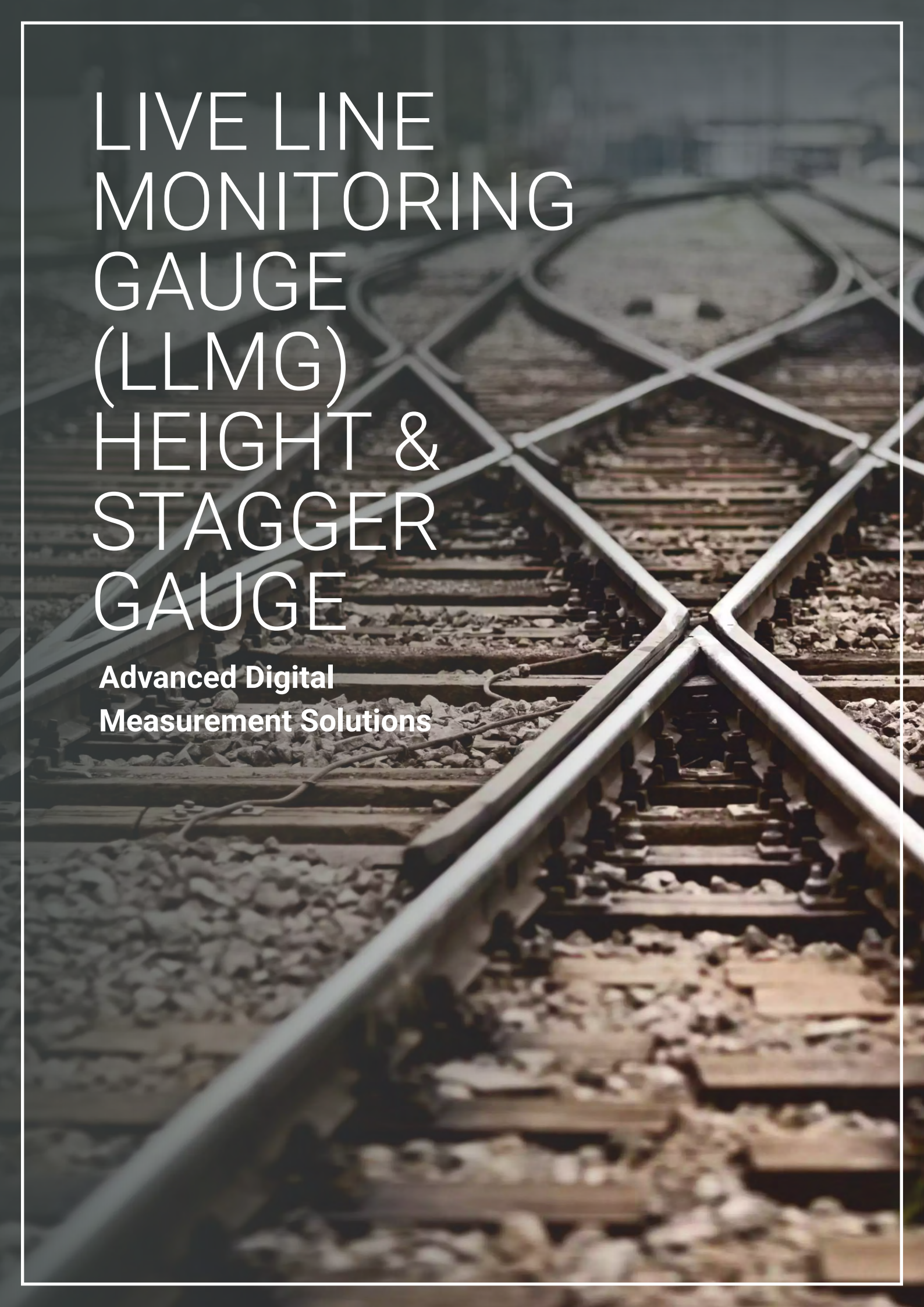
Compliance and Certification
We prioritize compliance with industry standards and regulatory requirements, ensuring that our products meet or exceed safety standards, certifications, and guidelines, providing peace of mind and confidence to our clients.

Innovation and Customization
With our in-house design and manufacturing capabilities, we offer innovative and customizable safety solutions tailored to meet the specific requirements and challenges of each railway and metro project, ensuring seamless integration and optimal performance.

Expertise and Support
Backed by a team of skilled engineers, technicians, and safety experts, we provide comprehensive support, from initial consultation and design to installation, training, and after-sales service, ensuring customer satisfaction and project success.

LIVE LINE MONITORING GAUGE (LLMG) HEIGHT & STAGGER GAUGE

Advanced Digital Measurement Solutions



Live Line Monitoring Gauges (LLMG) are essential for ensuring thesafety and efficiency of railway systems.

Deviations in contact line position can cause abnormal wear anddamage to pantographs.

The Live Line Monitoring Gauge provide accurate measurements of **Height** of contact wire, **Stagger, Implantation** and **Superelevation** in overhead equipment (OHE), allowing for precise monitoring and maintenance.

PRESENT SCENARIO

Existing solution for the monitoring of railway line:

Routine Inspections
Regular visual assessments of conductors, insulators, and support structures are essential. Operators check for signs of wear, damage, or corrosion.

Insulator Cleaning
Keeping insulators clean is vital. Dust, pollution, and bird droppings can affect their performance. Regular cleaning ensures optimal insulation.

Joints Tightening
Over time, joints (where conductors connect) may loosen due to vibrations. Regularly tightening them prevents electrical losses and ensures stability.

Clearing Hot Spots
Hot spots occur when connections become loose or corroded.These areas experience higher temperatures, risking damage. Detecting and addressing hot spots promptly is crucial.

The LLMG has been successfully implemented in various railway projects, providing reliable data for maintenance and ensuring the safety of railway operations.

Case studies demonstrate the effectiveness of the LLMG in different environments and conditions.

PRODUCT OVERVIEW

The LLMG is a state-of-the-art device designed for the railway industry

KEY FEATURES INCLUDE

- High precision measurements
- Robust and durable design
- Easy to use interface
- Bluetooth and wifi connectivity for data transfer

COMPONENTS OF LLMG

1. **Sensor Module:**
   - **Height and Implantation Sensor:** The laser module is used for taking the height of contact wire and Implantation of structure.
   - **Consists of laser source and sensor and is installed at the top of the gauge.**
   - **Stagger Sensor:** The stagger sensors are connected at the base of gauge to record the stagger values of contact wire at a point.
   - **Cant Sensor:** The sensor to measure Cant of track are connected at the bottom plate of gauge.
   - Works on the principle of displacement and records the difference in height at both ends of gauge resting on rails.

2. **Controller module:**
   - Consists of processor which has to gather the data of height, stagger, implantation and cant from various sensors installed on the gauge.
   - Should also have wi-fi device connected to it.
3. **LLMG Mobile Application:**

   Mobile application supported on Android 9.0 & above on mobile/ tablets having RAM of 4 GB.
   - User friendly and simple in desig
   - Produce the Height and stagger profile of contact wire by plotting them on graphs automatically for analysis of the profile of OHE.
   - Facility of recording GPS location of selected asset by using the GPS of mobile.

TECHNICAL SPECIFICATIONS

Specifications of the LLMG include:	Measurement Range: 0-2000 mm
Accuracy:	±1 mm
Weight of module:	8-10 kgs
Connectivity:	Bluetooth & WiFi
Battery Life:	Up to 8 hours
Operating Temperature:	0 to 60°C
Material:	Aluminum powder coated

HOW IT WORKS

Imagine the gauge as a sophisticated ruler that combines traditional measurement techniques with modern digital technology. Here's a step-by-step visualization:

Place the Gauge Position the gauge on the track, aligning it with the contact wire and the centerline of the track.

Laser Measurement Aim the laser range finder at the contact wire. The laser measures the distance to the wire and calculates the stagger.

Tilt Measurement The tilt sensors measure the angle of the gauge relative to the horizontal plane, determining the superelevation.

Digital Readout Both stagger and superelevation readings are shown on the digital display, providing clear and precise data.

Data Logging Use Bluetooth connectivity to transfer the measurements to a mobile device or computer for analysis and storage.

ADVANTAGES

Benefits of using the LLMG include

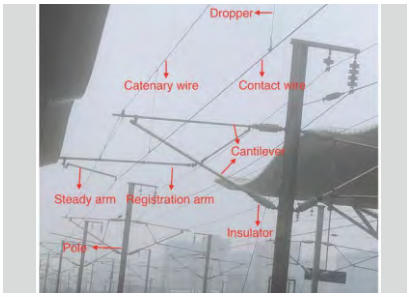
- **Durable design**
- **High Accuracy:** The use of laser technology and tilt sensors ensures precise and reliable measurements.
- **Efficiency:** Digital readings and wireless data transfer speed up the measurement process.
- **User-Friendly:** The digital display and Bluetooth & Wifi connectivity make it easy to use and manage data.
- **Safety:** The lightweight and foldable design allow for easy handling, reducing the time operators spend on the track.

VISUAL ILLUSTRATIONS

Measuring using the Live Line Gauge

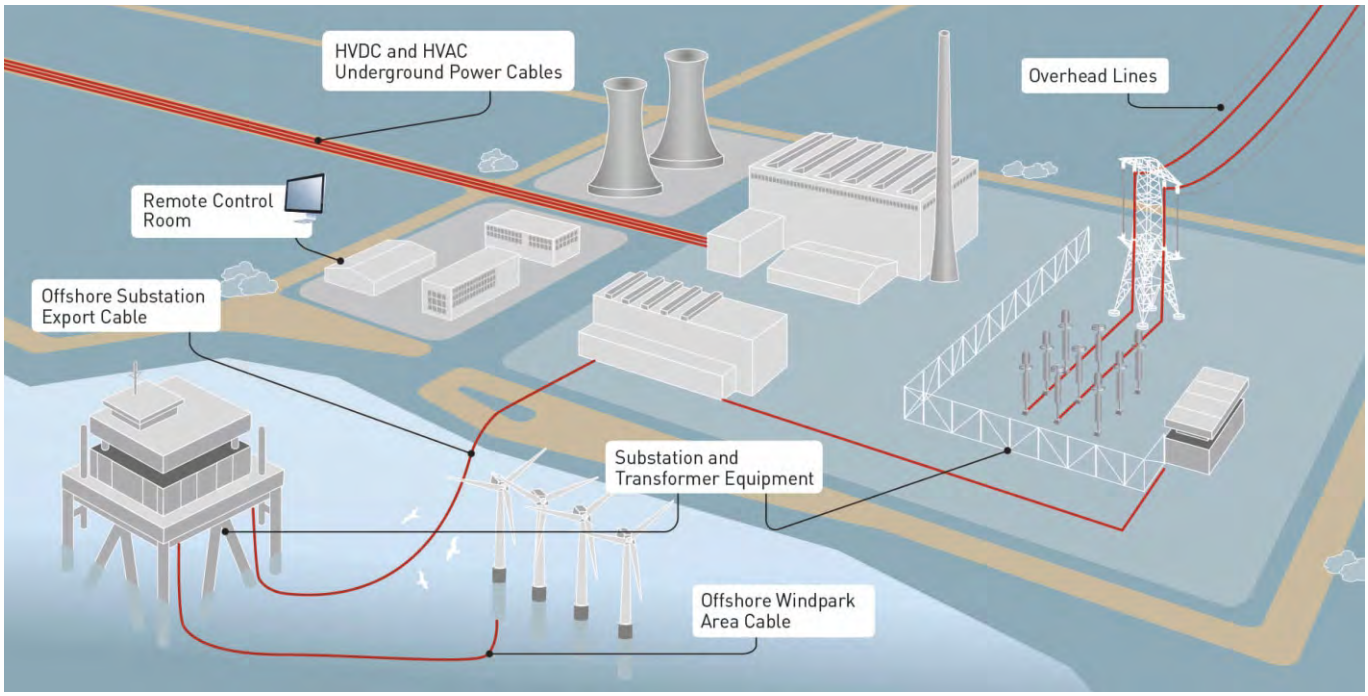
Maintenance of railway line without the gauge

Overhead Line Maintenance



Labelled diagram of Overhead Line

Live Line Monitoring Gauge Model

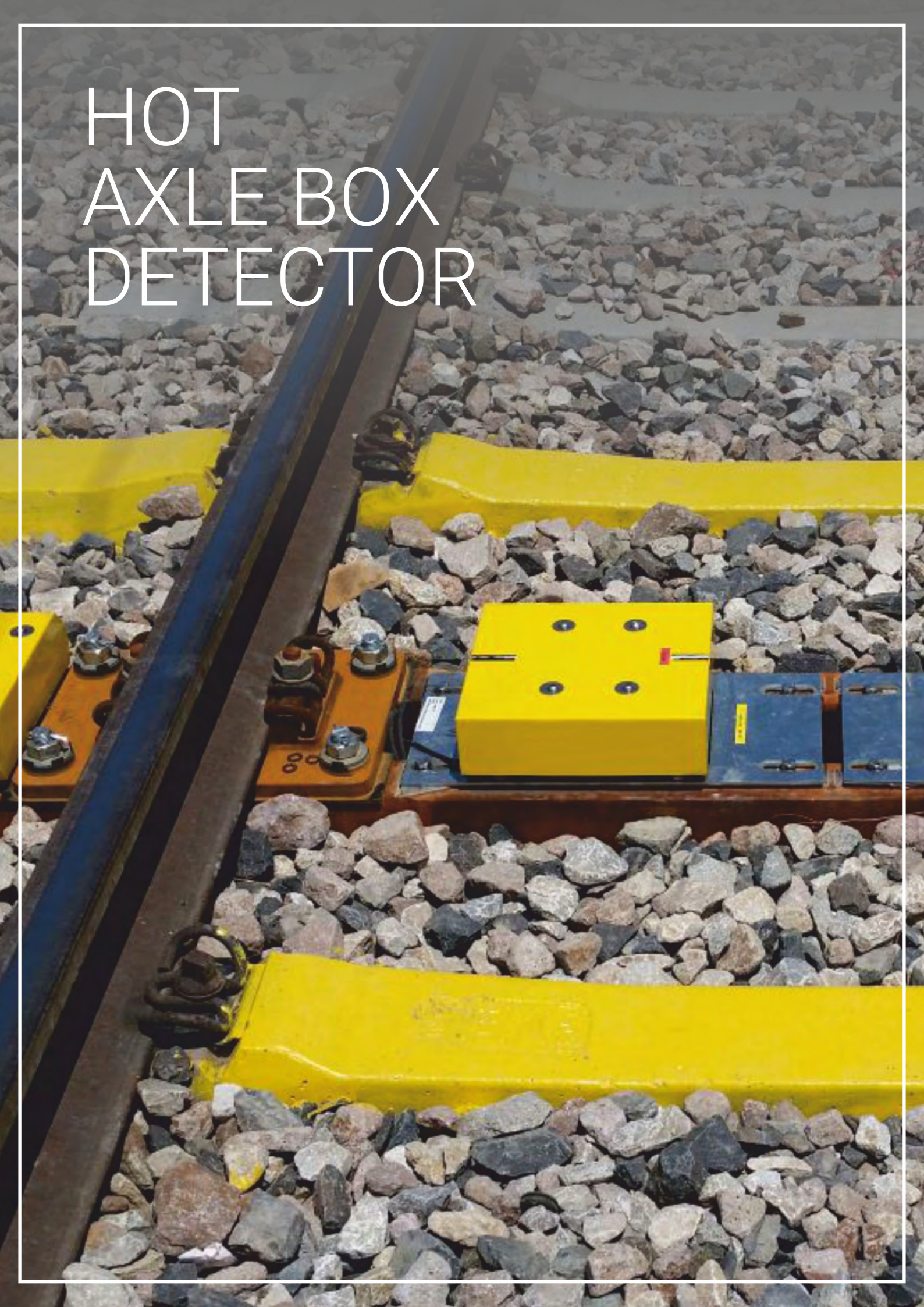


Power Supply to the Overhead Line

CONCLUSION

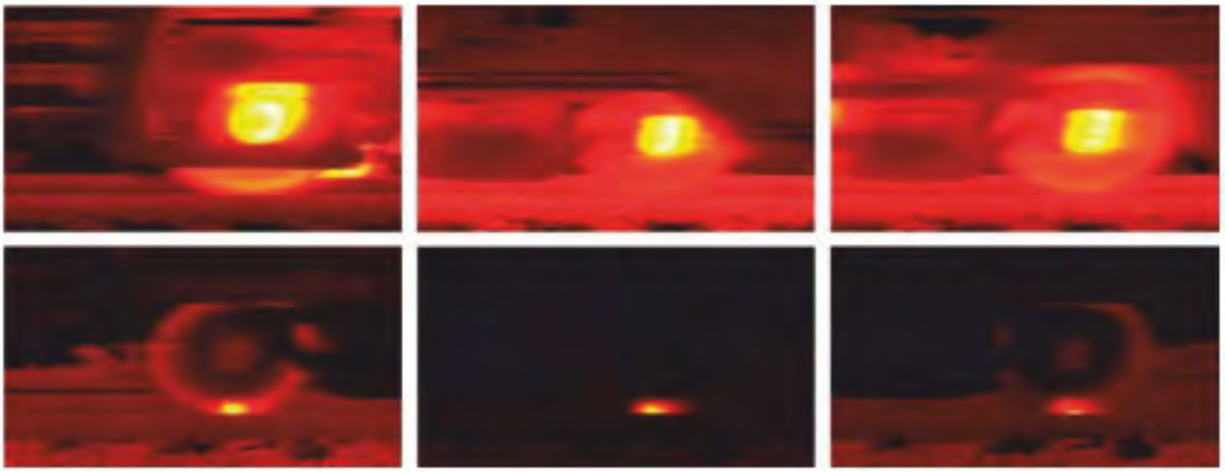
- **The LLMG is a vital tool for the railway industry, offering precise measurements and robust performance.**
- **With its advanced technology and user-friendly design, it enhances safety and efficiency in railway operations.**

HOT AXLE BOX DETECTOR



WHAT ARE HOT AXLE BOXES ?

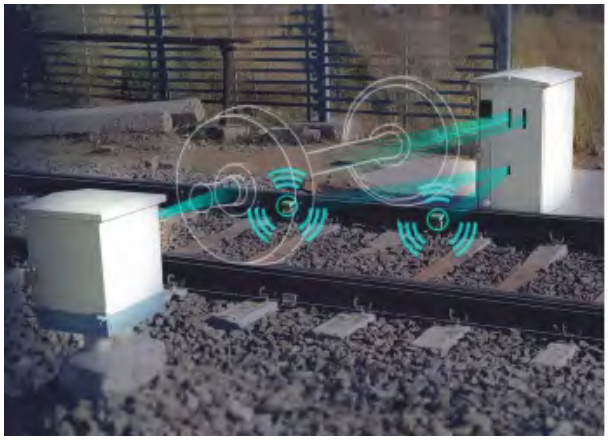
A hot axle box is a railway vehicle axle bearing that overheats due to inadequate lubrication or mechanical issues. Hot axle boxes can cause serious incidents like derailments and fires, so systems are in place to detect them and prevent problems.



HOT AXLE BOX DETECTORS

Hot Axle Box Detector (HABD) is an automated wayside detection system for detecting hot axle boxes & locked wheels by monitoring temperature of the axle box bearings, wheel rim/discs and brake discs

TYPICAL EXAMPLE OF HABD



PRODUCT DESCRIPTION

This System Consists of 2 recording devices one (proximity sensor) for counting the Axles and the other (infrared sensor) for recording the Axle Box temperature.

HABDs are typically installed along railway tracks and use infrared sensors to detect the temperature of passing train axles and wheels. When a train passes over the detector, the sensors measure the temperature of each axle box and wheel. If the temperature exceeds a predetermined threshold, an alarm is triggered, and the train is flagged for inspection.

KEY FEATURES

- High-precision temperature measurement
- Real-time monitoring
- Durable and reliable in harsh environmental conditions
- Easy integration with existing railway infrastructure
- Remote data access and reporting

SYSTEMS INVOLVED

Sensing System:

- **IR Sensors:** Measures temperatures from -59°C to 1000°C with high accuracy and quick response times.
- **Proximity Sensors:** Detects train presence and wheel position with reliable PNP output.

Data Acquisition System:
The Data Acquisition System in an HABD setup serves as the central hub that interfaces with multiple sensors, processes the collected data, and ensures real-time monitoring and reporting. It is designed to operate reliably in harsh environmental conditions, providing accurate and timely information to railway operators to prevent potential failures and ensure safety.

GSM Technology:

- GSM modules are used in HABD systems for wireless communication. They enable the transmission of data and alarms from the trackside units to the central control center.
- GSM technology ensures that real-time data is sent efficiently, allowing for prompt actions to be taken to prevent accidents.

Data Loggers:
Data loggers store the temperature readings and other relevant information. This data can be used for further analysis and maintenance planning.

Alarm system:

- An alarm system is integrated to alert the train crew and railway operators about anydetected hot axles or boxes.
- This system can include visual and audible alarms, as well as automatic signaling to stop the train if necessary.

UPS System:
The Uninterruptible Power Supply (UPS) in a Hot Axle Box Detector (HABD) system ensures continuous operation and data integrity during power interruptions. The UPS provides backup power, allowing the system to function seamlessly without any downtime, which is critical for monitoring and safety. It maintains power to the data acquisition units, sensors, and communication modules, preventing data loss and ensuring that the system can still alert operators to potential issues even during a power outage. This reliability is essential for maintaining the safety and efficiency of railway operations.

These are all the sensors and different types of systems involved in Hot Axle Box Hot Wheel Detector.

BENEFITS AND ADVANTAGES

Safety
Early detection of overheating prevents accidents and ensures passenger safety.

Efficiency
Reduces maintenance downtime and costs through predictive maintenance.

Reliability
Robust design ensures consistent performance in harsh conditions.

Cost-Effective
Long-term savings on repairs and operational costs.

Compliance
Adheres to industry safety standards and regulations.

Real-Time Monitoring
Continuous and immediate detection of hot axles and wheels, allowing for timely interventions

Automated Operation
Reduces reliance on manual inspections, minimizing human error and operational costs

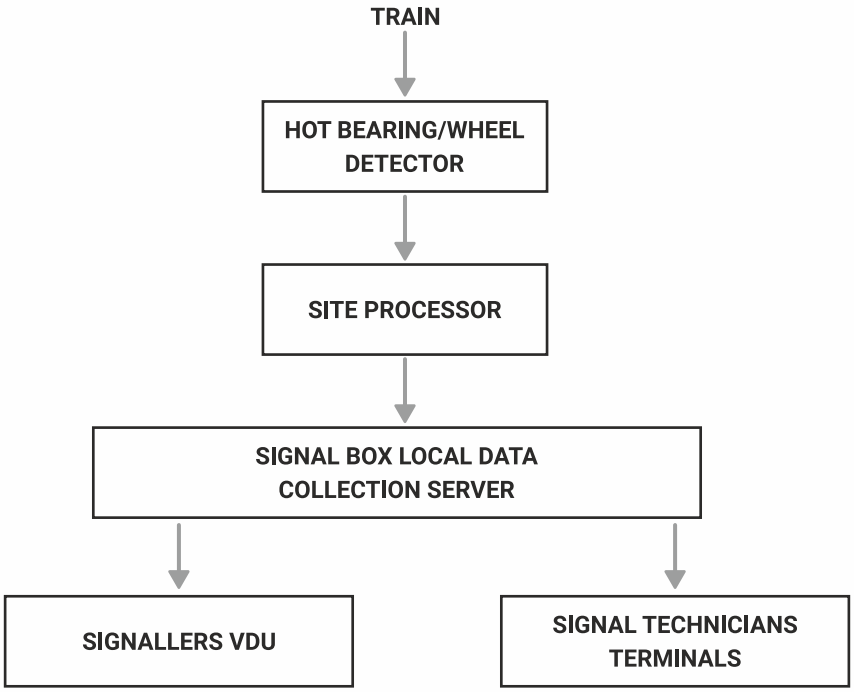
Comprehensive Coverage
Can be installed at multiple points along the railway network for thorough monitoring.

INSTALLATION AND INTEGRATION

Easy Installation and Seamless Integration

- HABD system is designed for easy installation on railway tracks and seamless integration with the existing monitoring systems. Our comprehensive installation guide and support services ensure a smooth setup process.
- The installation and integration of Hot Axle Box Detectors (HABD) in Railways can be accomplished with minimal disruption to existing tracks and systems. This processinvolves several critical steps to ensure seamless integration and optimal functionality.
- First, detailed site surveys and planning are conducted to identify suitable locations for HABD installation along the railway tracks. The selected sites are strategically chosen to maximize coverage and ensure early detection of axle box overheating issues.
- Next, specialized mounting brackets and fixtures are used to securely install the HABD sensors and related equipment along the track. These brackets are designed to be compatible with the existing track infrastructure, minimizing the need for any extensive modifications or disruptions.
- The sensors, including infrared (IR) sensors and proximity sensors, are positioned accurately to monitor the axle boxes and wheel temperatures of passing trains. These sensors are calibrated to detect temperature anomalies and send real-time data to the data acquisition units (DAUs) for processing
- The DAUs, equipped with advanced microcontrollers and industrial PCs, are installed in weatherproof enclosures near the trackside. These units collect, process, and transmit data from the sensors to the central monitoring system via GSM modules. The communication infrastructure ensures reliable data transfer, even in remote areas.
- Additionally, the installation process includes integrating the HABD system with existing railway signaling and monitoring systems. This integration allows for seamless data sharing and real-time alerts, enabling prompt action in case of any detected anomalies.
- The use of Uninterruptible Power Supply (UPS) units ensures continuous operation of the HABD system, even during power outages. These UPS units provide backup power, maintaining the functionality of sensors, DAUs, and ommunication modules, therebyensuring uninterrupted monitoring and safety.

PRODUCT DESCRIPTION



EQUIPMENT USED:

Some of the equipment used in HABD are being listed below

1. Infrared sensor
2. Proximity sensor
3. Embedded PC system
4. A grey coloured box containing sensor controls and MCs
5. Solar panel
6. Battery
7. Converter

IMAGES OF EQUIPMENT

Infrared temperature sensor

Proximity sensor

ABOUT EQUIPMENT

Infrared sensor
These sensors detect infrared radiation emitted by the hot surfaces of wheels and axles. They provide accurate temperature readings that help in identifying overheating issues.

Proximity sensor
These sensors, typically inductive, are installed along the railway tracks and are responsible for triggering the system when a train approaches. The sensors accurately detect the passing wheels without physical contact, ensuring reliable and maintenance-free operation.

Battery:
Power backup up to 8 hours
HABD should be compatible with solar and battery system

TECHNICAL SPECIFICATIONS

These are the specifications of the equipment that are being used

Infrared sensor

- Temperature range = -50 deg. C to 975 deg. C
- Optical resolution 25:1
- PowerSupply:8-36V DC
- Environmental rating : IP 65 (NEMA-4

Proximity sensoR

- Sensor technology: inductive
- Mounting type: flush
- Sensing range :50mm
- Operating voltage: 10 – 30V DC

Embedded PC

- Processor: Dual-core / Core 2 Duo / Celeron
- Display Interfaces: HDMI & VGA
- RAM: 8GB of DDR3L1333 RAM
- Storage: 3.5” or 2.5” SATA HDD
- COM Ports: Minimum 2 COM ports
- USB Ports: Minimum 4 USB ports
- Connectivity: Dongle card for 4G/5G connectivity

WORKING

Detection Phase

- As a train passes over the detector, infrared sensors scan the axles and wheels for temperature readings.
- Each sensor captures the infrared radiation and converts it into temperature data.

Data Collection

- Temperature data from all axles and wheels is collected in real-time.
- The wheel detectors help in associating each temperature reading with the corresponding wheel position.

Data Processing

- The collected temperature data is sent to the data processing unit.
- The processing unit uses algorithms to analyze the data, comparing it againstpredefined temperature thresholds.
- It distinguishes between normal and abnormal (overheated) conditions.

Alarm Triggering

- If any temperature reading exceeds the threshold, the system triggers an alarm.
- The alarm system alerts the train crew and the control center through visual andaudible signals.
- An automatic signal can be sent to stop the train, preventing potential accidents.

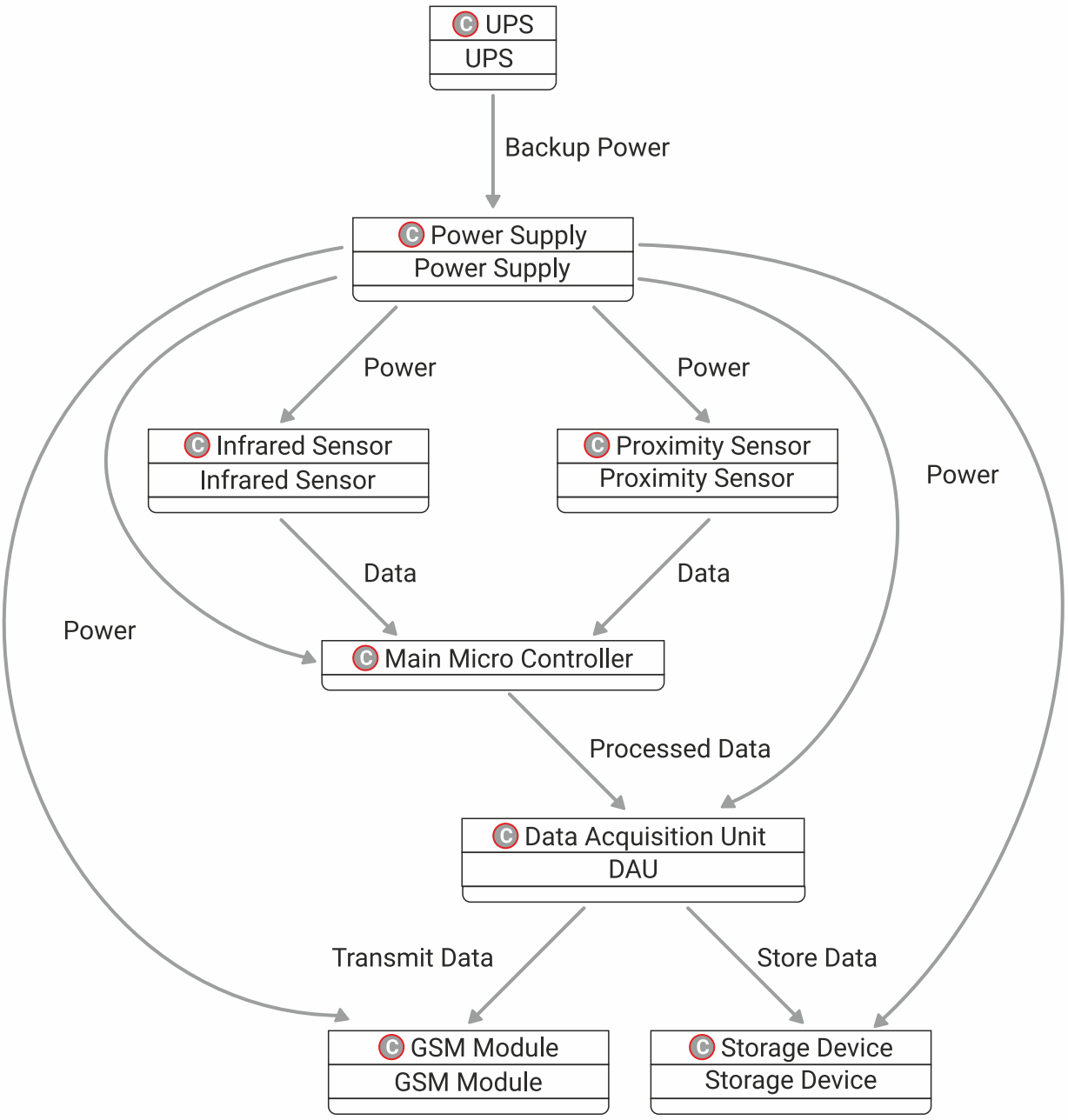
Communication

- The data, including temperature readings and alarm status, is transmitted via GSM to the control center.
- The control center receives real-time updates, allowing for immediate action.

Response and Maintenance

- Upon receiving an alarm, the train is inspected for overheated axles or wheels.
- Regular maintenance checks are performed to ensure the sensors and system are functioning correctly.

BLOCK DIAGRAM



EXISTING METHODS

1. **Manual Inspection**

Description:
Periodic manual inspections by railway staff using handheld infrared thermometers or visual inspections.

Disadvantages:

- **Labor Intensive:** Requires a significant number of staff and time.
- **Inconsistent:** Human error and variability in inspections.
- **Delayed Detection:** Cannot provide real-time data, leading to potential delays in identifying faults.
- **Efficiency:** Manual inspections are time-consuming and not feasible for real-time monitoring.
- **Frequency:** Limited by the number of available staff and their working hours.

EXISTING METHODS

2 **Infrared Thermal Imaging Cameras**

Description:
Cameras installed at strategic locations to capture thermal images of passing wheels and axles.

Disadvantages:

- **High Cost:** Expensive installation and maintenance.
- **Limited Coverage:** Only effective at specific locations, not continuous monitoring.
- **Data Management:** Requires significant infrastructure for data handling and analysis.

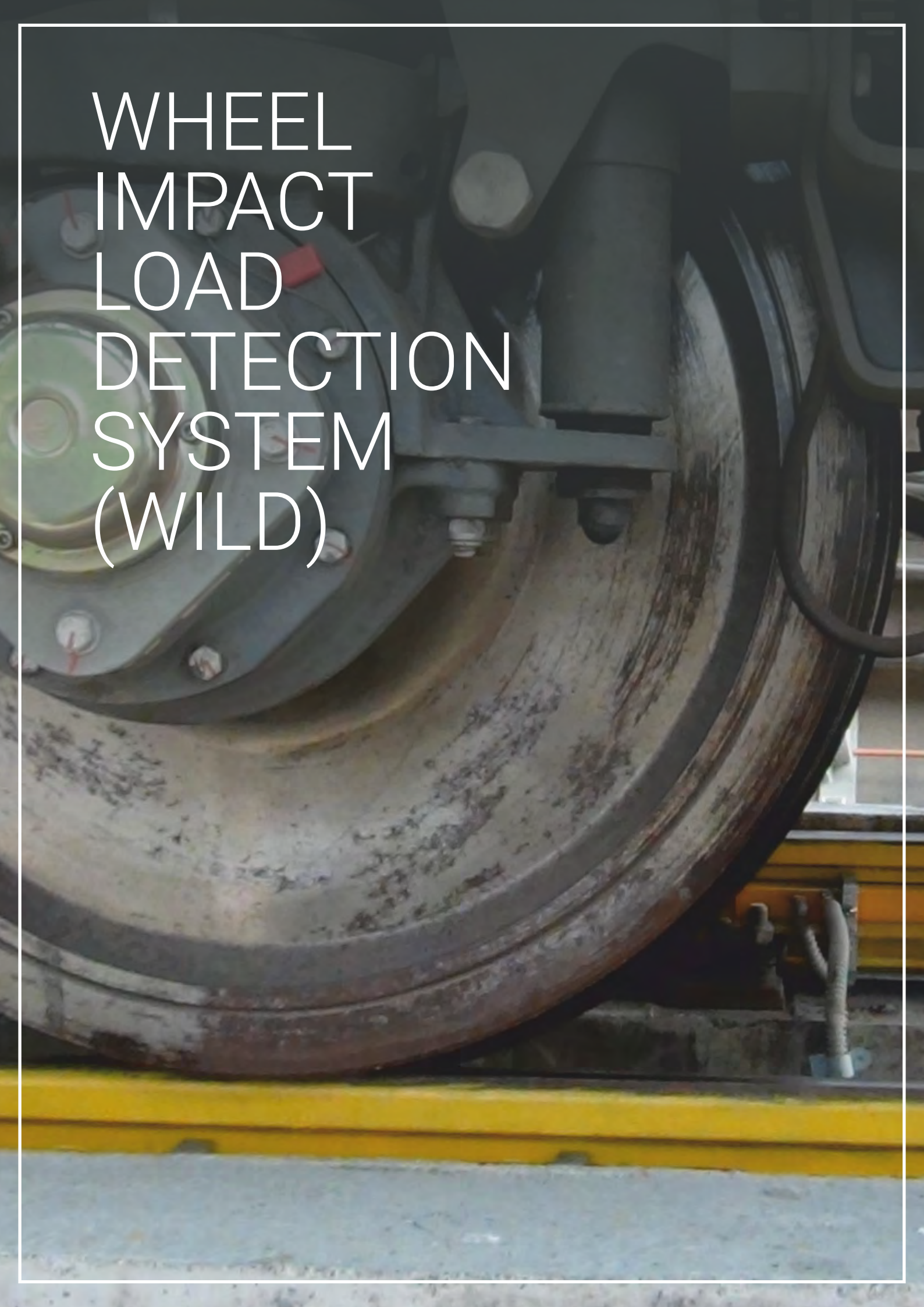
3 **Wayside Detectors (WILD - Wheel Impact Load Detectors)**

Description:
Measures the impact load of wheels on the track to detect flat spots and other issues.

Disadvantages:

- **Indirect Measurement:** Does not directly measure temperature, only the impact load.
- **Complex Analysis:** Requires complex algorithms and data interpretation.
- **Installation:** Installation and maintenance can disrupt normal railway operations

WHEEL IMPACT LOAD DETECTION SYSTEM (WILD)



The Wheel Impact Load Detection (WILD) System is an advanced solution designed to monitor and detect impact loads on the wheels of rolling stock in real-time. It integrates state-of-the-art technology including strain gauges, OCR (Optical CharacterRecognition), and RFID (Radio Frequency Identification) readers to provide accurate and reliable data for railway maintenance and safety.

NEED OF WILD

- The rail wheels are subjected to braking force, causing the wheels to stop rotating and start sliding.
- Due to this sliding, the wheel eventually becomes flat.
- This flatness in the wheel leads to an uneven application of force on both the rails and the wheel mechanism itself.
- This can lead to damage to the tracks, trains, and even derailment.
- WILD can also identify problems such as broken springs, cone defects, slide marks, bearing problems, and oil leakage.

Damaged wheel

Broken spring

Chipping of cone

Rusting

Salling

Indentations of rolling contacting of cone

FUNCTIONING OF WILD

1. WILD focuses on measuring the dynamic wheel load experienced by individual wheels as they pass over the detector. This load includes both the weight of thetrain and the extra impact from irregularities on the track, such as uneven joints, dips, or debris
2. The measured sensor values are then sent to signal conditioning units. Theseunits filter and amplify the signal because the raw output from sensors often contains unwanted noise and is very weak.
3. A section of track is equipped with sensors that are mounted on the web to measure shear strain. The measured strain is then used to calculate the corresponding shear load acting on the rails.
4. The processed data is then fed into a dedicated WILD system software program, which calculates the dynamic wheel load for each wheel and analyzes the readings to identify potential wheel abnormalities

5. **Integrated Vehicle Identification:** The system automatically identifies each passing vehicle, allowing for targeted monitoring and data analysis.
6. **User-Friendly Software and Alerts:** An intuitive software platform presents clear data and sends instant alerts to designated personnel via mobile app or designated channels, allowing for prompt intervention.
7. **Real-Time Monitoring:** Sensors strategically placed on the track measure wheel impact loads, detecting potential problems like cracks, flat spots, or uneven wear.
8. **Self-Diagnostic Capabilities:** WILDS continuously checks its own health, automatically detecting and reporting sensor failures, ensuring system integrity.

THE WILDS OFFERS A COMPREHENSIVE APPROACH TO WHEEL HEALTH MONITORING, GOING BEYOND BASIC DETECTION. HERE'S A DEEPER LOOK AT ITS ADVANCED FEATURES:

Severity Classification:
WILDS doesn't just detect defects; it categorizes their severity (critical, moderate, minor) based on impact load data. This allows for prioritized maintenance, addressing the most critical issues first.

Trend Analysis:
The software monitors historical data to identify trends in wheel wear patterns. This predictive capability helpsanticipate future problems before they escalate.

Reporting and Analytics:
WILDS generates comprehensive reports on wheel health, providing valuable insights for maintenance planning and resource allocation.

Scalable and Modular Design:
The system can be easily scaled to accommodate your specific needs, whether monitoring a single yard or an extensive railway network.

Secure Data Storage and Access:
WILDS ensures the security and integrity of your data with secure cloud storage and user access controls.

BEYOND THE RAILS: MOBILE APP ADVANTAGES

Real-Time Monitoring On-the-Go: The WILDS mobile app allows authorized personnel to access real-time data and alerts from anywhere with an internet connection. This empowers faster response times and informed decision-making.

Offline Data Access (Optional): For areas with limited connectivity, users can download critical data for offline access, ensuring informed decision-making even in remote locations.

Push Notifications: Stay informed with instant push notifications for critical alerts directly on your mobile device.

Sensors mounted on track

BENEFITS:

1. **Real-Time Data Acquisition**
   Gather continuous data from any location, eliminating the need for manual interventions.
2. **Detailed Fault Detection**
   Pinpoint the exact source of problems with our advanced sensor technology.
3. **Predictive Maintenance**
   Anticipate potential issues before they escalate, maximizing uptime and minimizing downtime costs.
4. **Improved Safety**
   Proactively address safety concerns with real-time insights into system health.
5. **Reduced Operational Costs**
   Eliminate the need for frequent site visits and manual data collection.
6. **Scalable and Adaptable**
   Our WILD System can be customized to a wide range of applications.
7. **Integrated Technologies**
   Combines strain gauges, OCR, and RFID readers for comprehensive monitoring.
8. **High Speed Capability**
   Accurately tracks objects moving at speeds of up to 180 km/h.
8. **Harsh Environment Compatibility**
   Designed to withstand extreme temperatures and environmental conditions.
8. **Self-Diagnostic Feature**
   Routine checks on the operating condition and health of individual components with automatic detection and reporting of sensor failures.

OCR and RFID Technology

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