

Railway-News

M A G A Z I N E

We've Given Our Magazine a New Look!

Easily navigable Services, Infrastructure, Data & Information, and Rolling Stock sections

**& Digital Interlockings
in Germany ... p.34**

ISSUE ONE 2021

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we securely connect it.

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The bridge to possible

Letter from the Editor



Dear Readers,

For 2021 we have decided to revamp the look and features of our digital magazine. With real-world events and exhibitions still not taking place, we have introduced a new layout with clearly defined sections for different rail industry products & services. Easy to navigate and intuitively grouped, you will quickly find the areas of most interest to you. But more than that! We've also made this magazine more interactive. You will now be able to enjoy features paper magazines can't, such as embedded videos. To make it easier for you to save contact details, we have added QR codes that will save contact details straight to your contacts in your phone.

It has been great to see the rail industry's resilience during these past twelve months. After full initial closures of manufacturing sites, these activities have now resumed with new safety measures in place.

Rolling stock is being manufactured, tested and delivered and major rail infrastructure projects such as HS2 in the UK, Rail Baltica in Estonia, Latvia and Lithuania, and the Sydney Metro project, to name but a couple, are forging ahead with construction. At the same time important rail links are struggling. The fate of Eurostar hangs in the balance as a result of collapsed passenger numbers and a lack of financial support to help it weather the tide.

Keeping the rail industry strong is important, not just because of its role as a key service both for passengers and freight during COVID, but as a tool for combatting the major challenge of our time, which is climate change. We must reduce our greenhouse gas emissions, especially in transport. To achieve this, we must achieve large-scale modal shift and that will require new railway lines to be built. We must be ready for a world after COVID.

We are publishing our second issue of 2021 in May. If you would like to be represented in our magazine or on our website, please contact Andrew Lush at al@railway-news.com.

Please enjoy our first new-look issue of 2021!

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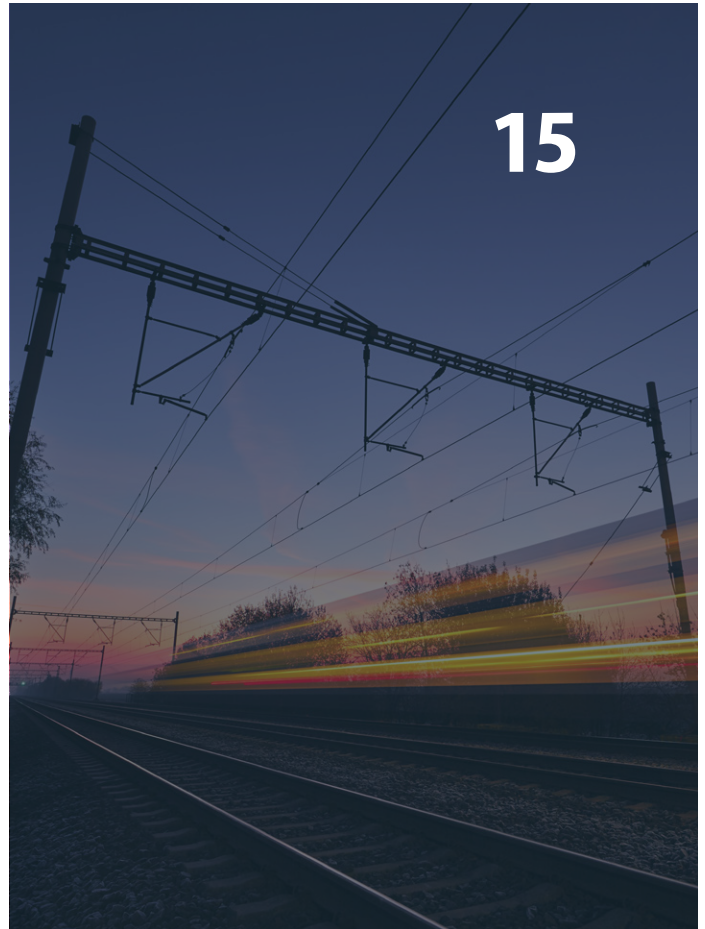
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FIRST STOP FOR THE TEST ON RAIL VEHICLES

From rubber bearing via bogie through car body.
IMA Dresden offers the full service test programm:

- Structural and component testing
- Strength analyses
- Environmental simulations
- Electrical tests
- Material testing
- Mobile measurements
- Simulation and strength assessments
- Damage analysis

We are the accredited, certified and independent test center for the rail vehicle industry.

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- The Test Centre for the Rail Vehicle Industry
- Simulation-Driven Product Development



»»» Shape the future. With a strong financing partner.

We support companies that invest in the future. This makes us a strong partner for Germany's and Europe's export industry. As a specialist for project and export financings carried out internationally, KfW IPEX-Bank has been standing by its industry clients for over 60 years. We assist all those who shape their own future – with long-term, fit-to-form financing structures designed by our professional experts. The future belongs to those who think ahead. Let's shape it together. [kfw-ipex-bank.de](https://www.kfw-ipex-bank.de)

KfW IPEX-Bank



IMA Dresden

Test, Analyse & Qualify



IMA Dresden – The test centre for the rail vehicle industry

We are the independent and accredited test centre for rail vehicles; we support manufacturers and suppliers in the development process and assist transport companies with damage analysis and product optimisation.

Specifically, this means that we test and validate bogies, railcar bodies and lots of other rail vehicle components in our testing halls, including electrical components. If required, we also uncover structural damage using non-destructive testing techniques and analyse damage and material properties.

In addition, we conduct measurement runs, assess measured data and use these to define test programmes all over the world. We calculate and create virtual simulations of loads,

assess the strength of products and areas of stress, and carry out strength and lifespan assessments. We also provide support for product development, taking strength-related, technological and structural boundary conditions into consideration.

We Are the Market Leader:

In terms of material and component testing, you are in the best hands with us. Every year, bogies and

railcar bodies fill the IMA test halls. They come to Saxony from Europe, America and Asia for experimental tests and approval tests. They are in good company here, with many further rail vehicle components such as axle-bearing housings, springs, swing arms, stabilisers, interior components, etc.

In Focus: Strength Tests on Bogies



13 test benches on a test area of over 3,000 sqm especially for bogie frames

Whether you need carrying or motor bogies for locomotives, freight or passenger trains, we offer complete execution of strength testing, including transport and structural analysis, for the approval and development of bogies and bogie frames.

But even during the development and construction phase, our operating load tests, also called dynamic or endurance tests, provide clear readings and reliable results for potential product or manufacturing adjustments.

In this way, optimisation potential

is leveraged and follow-up costs caused by weak points or structural deficits are avoided.

In Focus: Strength Tests on Railcar Bodies

3 separate test tracks for railcar bodies to guarantee a high capacity. Sometimes it's like being at a railway station: a car body drives out and the next one drives in.

We perform static and dynamic testing, with or without temperature load.

Whether double-deck car, tramcar or centre coach, our experience in strength testing is uniquely extensive, just like our testing capacity including three test tracks.

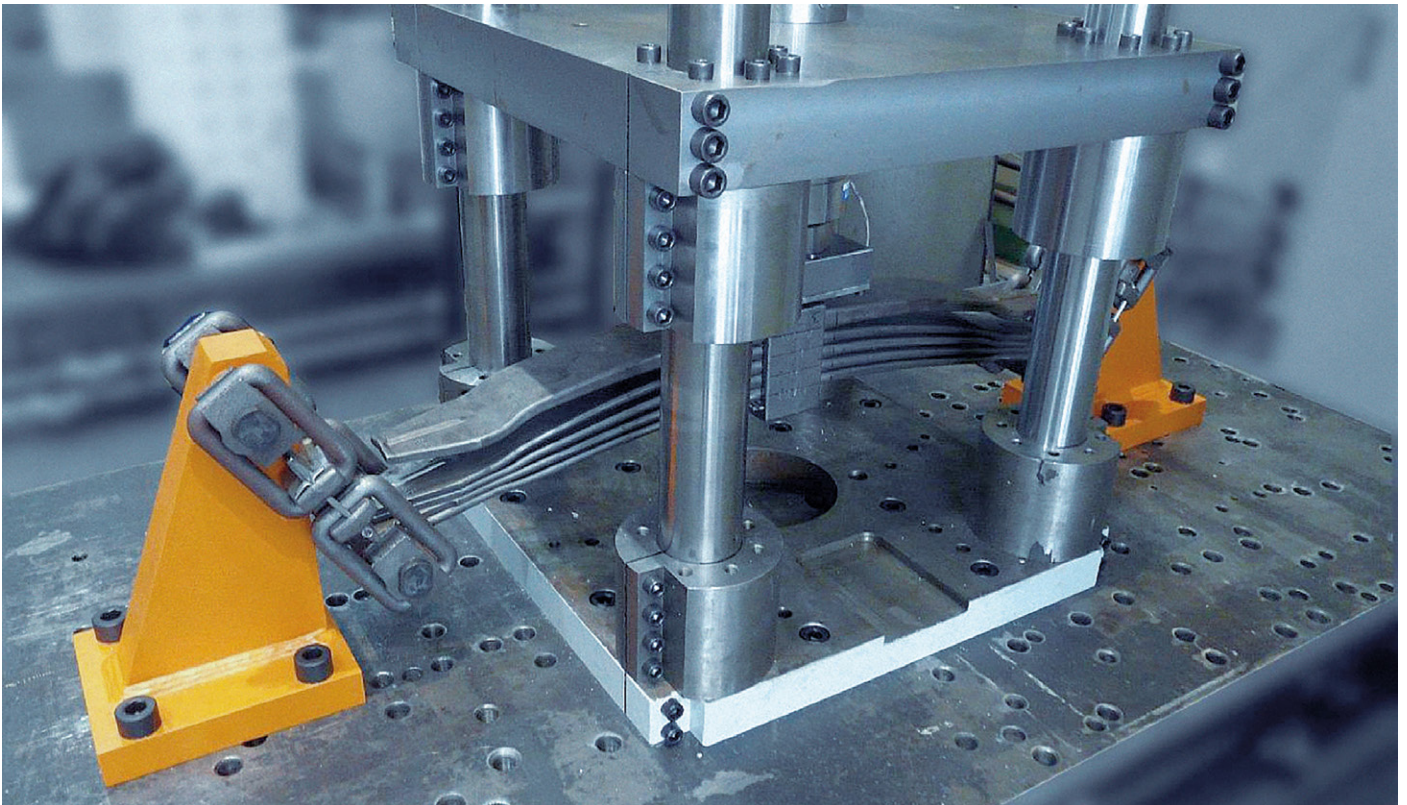
From Test Planning to Test Report: Rail Vehicle Components

In order to ultimately prove the strength of the components and guarantee their stability, we devote the utmost attention to railcar components, examining every detail you require and providing optimised testing scenarios.

We not only implement computational and theoretical but also experimental simulations for static and dynamic loads on components, develop test concepts and individual testing devices and elements for load introduction.

From the dimensioning and design to the verification of stability our test and calculation engineers co-operate intensively – in terms of reliable results.





Damage Analysis

Despite new, innovative production technologies and manufacturing routines, damage can still occur as a result of product defects, installation errors or incorrect operation.

Causes may be material based and/or production related. In addition, a faulty design can cause product failure, while damage can result

from loads or external influences. Through a rigorous systematic approach, we can examine the direct cause of the damage by utilising material analysis methods.

We will identify the type of damage and determine the reason why it has occurred. In doing so, we also utilise mechanical technology, related, physical, material analysis and materialographic examination methods.

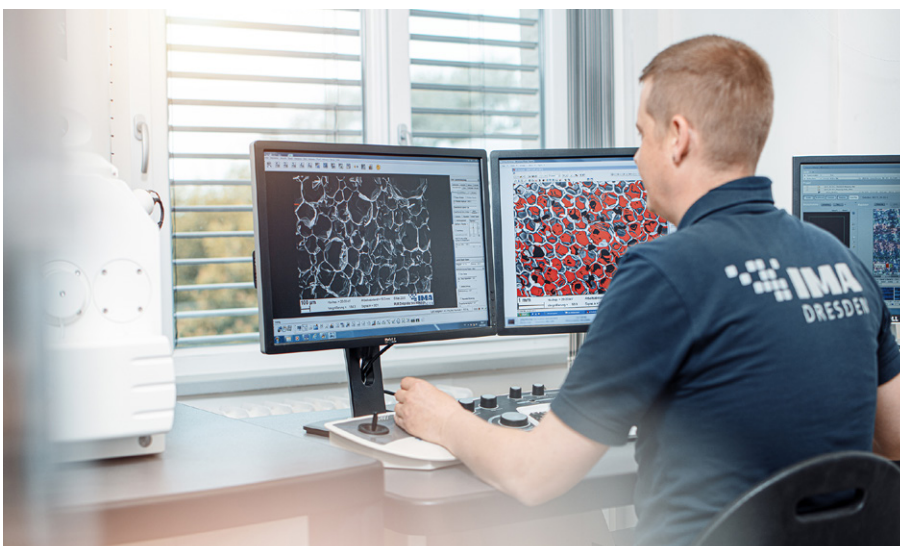
IMA Dresden – And It Works:

- Structure and component testing
- Material testing
- Damage analysis and materialography
- Non-destructive testing
- Electrical testing
- Simulation and strength assessment
- software systems for test and laboratory data



Contact

Website



INNOVATIVE SOLUTIONS IN RAILWAY INDUSTRY 6th APRIL 2021

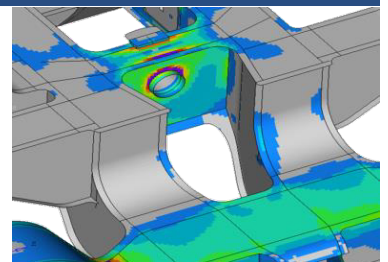
eCon Engineering Kft has been offering a wide variety of engineering solution in various industry for over 20 year. With our experience in finite element simulations, we provide solutions for numerous problems ranging from method development through workflow automation to complex assessments.

JOIN OUR FREE WEBINAR ON 6TH APRIL TO GET TO KNOW HOW ENGINEERING SIMULATION CAN CONTRIBUTE TO RAILWAY INDUSTRY WITH INNOVATIVE IDEAS AND CUTTING-EDGE TECHNOLOGY!

OUR CASE STUDIES & PROJECTS

Strength and Durability Analysis of railway components

- Evaluation of weld-seams of a railway bogie
- Evaluation of weld-seams of a railway king-pin
- Strength Analysis of railway brake-system

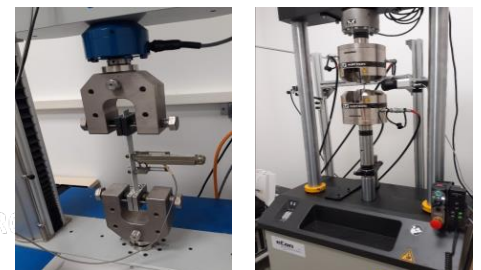


Material testing solutions

- Obtaining composite material parameters
- Fatigue testing of welded steel structures

Analysis and Optimization of polymer composite parts

- Instrument board
- Railway seat



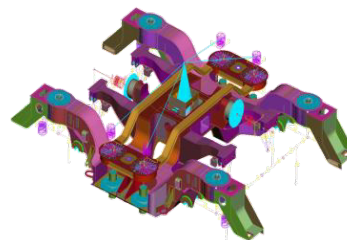
Instrument Panel

- Quasi-static loadcases
- Evaluation of composite failure criteria



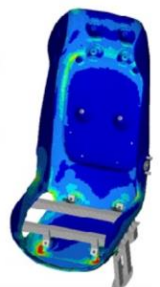
Motor Bogie

- Standard load-case combinations
- Strength assessment



Railway seat

- Stiffness & strength analysis
- Composite ply book



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eCon Engineering Kft

Simulation-Driven Product Development

eCon Engineering Kft is a Hungarian company founded in 2002. Its field of activity is engineering services, consulting, high value-added technical development activities.

Since its founding the company has dealt with the distribution and support of the ANSYS engineering simulation software in Hungary and the Adriatic region. It also deals with finite element calculations, computational fluid dynamics and simulation process development.

Another business unit of the company is the special purpose machine design team. This team consists of design engineers and electrical engineers and has a machine assembly workshop

eCon Engineering Kft currently employs 80 people, it has the ISO 9001 quality management and ISO/IEC 27001 data security system certificates as well as the TISAX Level 3 automotive supplier certificate.

Simulation of Railway Vehicle Parts

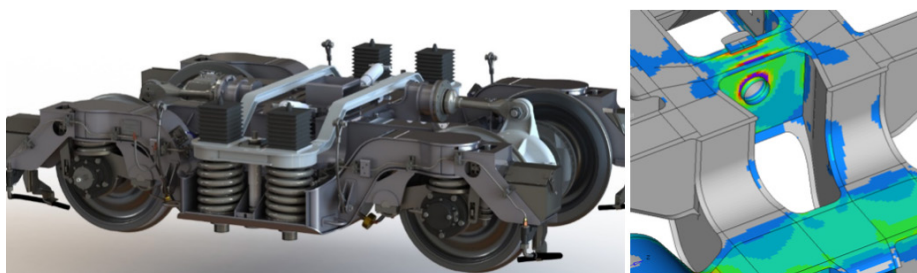
We offer to support the development of different products with simulation. During a motor bogie simulation, the mechanical loads and boundary conditions were based on the railway standard "EN 13749 or EN 12663 – Railway applications, structural

requirements of railway vehicle bodies" which describes the relevant load cases that represent the different operating conditions of the structure.

Based on the stress results and defined cycle of numbers for each load case, we performed fatigue evaluation according to different welding standards and guidelines such as FKM, IIW, EuroCode3 or DVS.

Depending on our customer's needs we can perform mechanical tests of relevant welded specimens with the material and technology used by the customer and derive a validated, own fatigue evaluation method.

Fatigue analysis of welded steel structures





Example of composite parts in a railway wagon

Composite

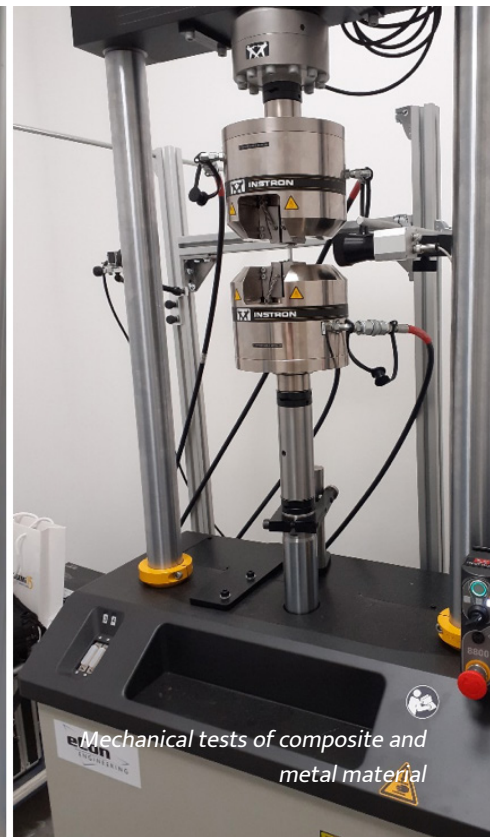
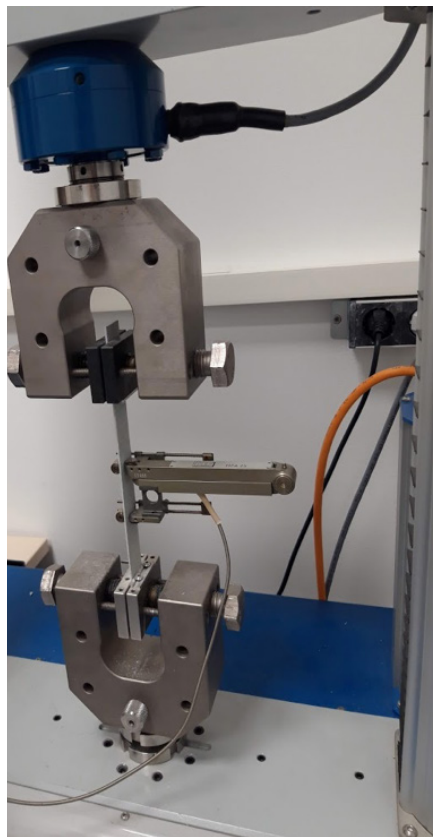
We perform different composite simulations. In addition to these capabilities we have design capabilities as well. For railway seat simulation, we obtain relevant load cases using the UIC-566 standard.

We can evaluate static failure according to different composite failure criteria and also fatigue with a self-developed tool in ANSYS.

Material Testing

When simulating composite structures, it is very important to determine the direction-dependent mechanical parameters of the material accurately.

The material testing lab of eCon Engineering has a 50kN tensile testing machine and a 100kN fatigue testing machine with additional equipment such as flexure fixtures, compression platens as well as optical and thermal cameras. This enables us to determine stiffness and strength values of composites in different fibre directions as well as in-plane shear stiffness values with high precision



Mechanical tests of composite and metal material

by measuring strains with strain gauges or in an optical way.

In case you have any simulation-related issue calling for tailored solutions, do not hesitate to contact us at: sales@econengineering.com or visit our [website](#) for more information!



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Zonegreen

The Key to Maintenance Depot Safety

The risks that rail maintenance staff face during their day-to-day work are undeniable; high-speed vehicles, high-voltage electricity and powerful machinery combine to make modern depots potentially deadly places to work.

This is further compounded by the growing number of vehicles on the network, putting increasing pressure on operators, and a desire to achieve 'pitstop style' servicing.

With existing facilities having finite space and with greater throughput being required, an increasing amount of work is being carried out in non-traditional areas such as stabling roads. It is becoming commonplace for cleaning, fuelling, sanding, CET and even minor maintenance activities to

be carried out on stabling roads. When these tracks were designed and built, they were never intended to be used in such a way and as a result, little or no protection is typically offered to staff working on them.

Time for Change

A culture change is required if the rail sector is to achieve operational throughput, whilst keeping the risk to staff as low as is reasonably



possible. To begin, we must alter legacy attitudes to safety measures.

Whilst “there has been no sustained change in the number of recorded near-miss events involving rail workers over the last five years,”

according to the RSSB Annual Health and Safety Report 2019/20, it continues: “although train operators input depot accidents to SMIS, other organisations that carry out train care and maintenance do not. This means the industry does not currently have a complete picture of depot risk.” In order for the risks to staff at maintenance depots to be fully addressed, they must first be accurately reported.

“Yards, depots and sidings account for 20% of all workforce harm – with 29% of fatalities in the last five years occurring in yards, depots and sidings (YDS).”
Source: RSSB Annual Health and Safety Report 2019/20.

When we consider that the real harm numbers for depots are likely to be much higher than recorded, it is clear that changes need to be made.

Safety by Design

The only way we can reduce harm to staff is to design safety into

depots at the earliest opportunity and acknowledge the changing maintenance environment, such as work being conducted on stabling roads.

It is essential that new build facilities and modernisation projects consider the risks to staff at the design stage and look to integrate available technologies, such as Zonegreen’s market-leading

Depot Personnel Protection System (DPPS).

The planned implementation of technologies such as DPPS, brings the concept of safety by design to depots. Network Rail defines safety by design as “[controlling] health and safety risks in infrastructure, rolling stock, equipment and processes by early consideration of potential risks and dealing with those risks at the design stage.”

However, all too often new works or modifications fail to take simple steps to avoid potential hazards. The RSSB identified the top three underlying causes of near misses as ‘decision error’, a ‘slip or lapse’ and ‘verbal communications’.

Whereas traditional depot safety relies on paper permits and manual systems that could be misinterpreted or applied incorrectly, DPPS uses intuitive





technology to automate safety and remove the human element. It physically eliminates the risks posed by SPADs, overhead lines and high-powered equipment, making it easy to set up safe areas in which to work, where it is impossible for staff to be harmed by decision errors or lapses in communication.

RFID tags identify when an individual is working on a maintenance road, whilst powered derailleurs protect them from unexpected train movements.

“The key to reducing staff harm is to minimise the margin for human error.”

The system also incorporates klaxons and beacons to provide audible and visual warnings of moving vehicles.

Unique Challenges

The RSSB Health and Safety Report 2019/20 concluded: “Britain’s railways rely on a mix of Victorian engineering and new technology – with everything else in between. Each poses its own challenges. The old infrastructure was built to last. It has done so for over a hundred years, but for how much longer unaided?”

Thankfully, help is at hand. Each DPPS system is designed specifically to meet the individual needs of the depot and its function. It is flexible and future-proofed, enabling it to adapt to the changing maintenance landscape; it can be interlocked with signalling systems and existing third-party equipment such as wheel lathes.

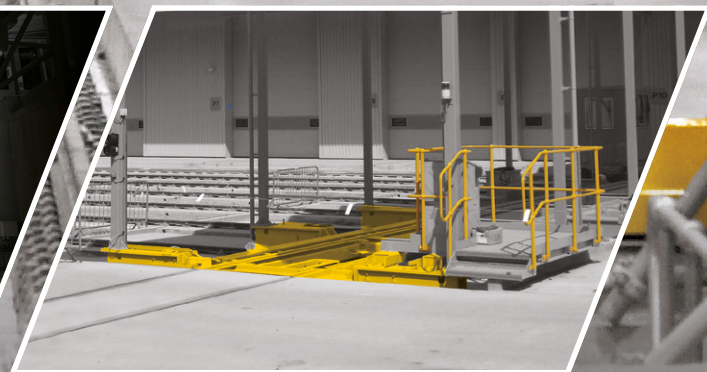


For more information about DPPS or Zonegreen’s range of rail depot safety equipment, telephone (0114) 230 0822 or visit www.zonegreen.co.uk.



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- EXHAUST EXTRACTION
- UNDER FLOOR WHEEL LATHES



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 Directory

 Infrastructure

Mechan

Traversing the UK

Is it a misnomer to call traversers a space-saving device?

There's no denying their sheer size and scale makes them hard to miss in rail depots, ports and freight yards, but they play a vital role in reducing the length of terminals and maintenance roads.

Sheffield-based Mechan is one of the only firms in the country with the ability to design and build bespoke traversers. The depot-equipment specialist holds the record for the largest UK installation – a 90-tonne behemoth operating at the Port of Felixstowe, which measures 30 metres in length and has a capacity of 170 tonnes. Traversers are used to move rail vehicles in a perpendicular direction to the track, allowing them to be transferred quickly, safely and efficiently between roads. Each one is designed from scratch, to meet the unique needs of the workshop and they can cater to trains of all sizes, from a single carriage up to the heaviest freight locomotives.

Designing for DIRFT

Mechan is currently building a 140-tonne capacity traverser for the

new 29 million GBP intermodal rail freight terminal being constructed at the DIRFT logistics park in Northamptonshire.

Working closely with multidisciplinary main contractor Winvic, the firm has designed the multi-rail traverser to suit the site's specific conditions. It spans 28 metres and comprises an access platform plus loco buffer to prevent trains overrunning.

Known as DIRFT III, the 344-hectare project comprises 9km of new lines, three new bridges and a 79,000 square metre terminal slab. Mechan's traverser will be situated outside the terminal building and used to move Class 66 locomotives, so they can return quickly to service after loading/unloading. It has allowed the terminal length to be shorter, as a head shunt isn't required.

Lindsey Mills, Mechan's sales manager, said:

"We were really pleased to secure a contract for the DIRFT III traverser after successfully completing a competitive tendering process and it is a pleasure to work with Winvic on this key project. Although the sheer size of a traverser makes each installation a challenge, they are actually a great space-

saving device, allowing trains to be transferred between tracks easily and efficiently."

Mechan is constructing the traverser at its Sheffield headquarters and it will then be dismantled for delivery to site. It is due to be installed and commissioned in April, before training is provided to end user, Prologis.

Winvic commenced construction of DIRFT III in June last year and it is expected to be completed by the summer. The intermodal rail terminal will enable 24, 775-metre trains to carry freight in and out of the logistics park, while the concrete yard will provide space for the storage of approximately 460 containers.

Winvic's Rob Cook, civils and infrastructure director, added:

"As rail traversers aren't that common in the UK, this is a particularly exciting element of an already significant and complex scheme. Mechan's reputation is second to none and our design teams have been working very well together. We are looking forward to seeing this specialist piece of equipment – that is central to the compact nature of the terminal's design – being installed on site."



Historic Holgate

Mechan's traversers incorporate the latest technology, to ensure they can adapt to the changing needs of depots and longer trains.

In 2019, the firm worked with Story Contracting to deliver a 130-tonne unit to Network Rail's Holgate depot in York, to replace a 50-year-old traverser that was at the end of its useful life. It has the most sophisticated software the firm has used to date.

The new installation has a larger capacity than its predecessor and 145-metre travel distance, to accommodate the current fleet, whilst future-proofing it for upgrades.

Sited externally, at the entrance to the maintenance shed, the traverser is used to move carriages between workshop roads.

Lindsey added: "Holgate is a historic rail depot, which brings its own challenges when maintaining modern rail vehicles, but following a series of overhaul schemes and investment in new equipment, it is now playing an integral role in the north's rail services."

"We were approached about the construction of the traverser, as we are the only UK firm with a proven track record of successful

installations. After viewing our work for Hitachi at its Newton Aycliffe facility, they could see we were capable of delivering such an individual project on time and on budget."

For more information about Mechan's bespoke traversers, telephone (0114) 257 0563, visit www.mechan.co.uk or follow the firm on Twitter, @mechanuk.

Mechan

A CIM Group company

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 Directory

< Infrastructure

FirstClass Safety & Control

A Fresh Approach to Depot Safety that's FirstClass!

Essex-based safety control system specialist FirstClass Safety & Control (FirstClass) have been supplying safety control systems for over 20 years.

The company was created following a management buyout of the safety control division of Beck & Pollitzer back in 2017 and has continued to prosper and develop.

Depot protection systems are just one of the products offered for the rail sector, along with depot control systems and locally operated points systems (LOPS). This range of products means that FirstClass can provide a rail depot operator with a fully integrated safety system.

FirstClass developed an industry-first in 2017, the RFID operator control panel, allowing users to log on and off using a RFID card, the same card that links to the depot

security system and any other RFID-based system. The operator control panels also use pictorial menu screens, eliminating the need for “wordy” on screen instructions, and allowing translation into multiple languages at a fraction of the cost

of other systems on the market. All FirstClass Safety systems come with SIL 2 level safety-certified as standard. Additional features of the FirstClass depot protection system that can be provided are depot door interlocks, high-level gantry access





interlocks, wifi interlocks and OLE interlocks, to name only a few of the options that can be integrated.

All FirstClass depot protection and depot control systems are designed to the client's specification, allowing 100% tailored solutions, not a standard product that has been tweaked.

All of the technical capabilities of FirstClass are backed up with unrivalled service support, available 24 hours a day with full on-site support, as well as back-office support for software and online diagnostics.

Looking to the future FirstClass is excited to be developing rail safety systems that incorporate their knowledge of the oil & gas sectors, for applications such as hydrogen fuelled trains, where the TUV Functional Safety Engineer certification FirstClass holds is a pre-requisite for system design and verification.

FirstClass are also going global with the recent announcement of a partnership with Freightquip for the Australian and New Zealand markets. This partnership has already produced its first order, a Depot Protection System for a maintenance depot located in Melbourne. Watch this space for further news of this and other global contract wins!

With a track record of installations over the past 15 years across the rail sector, from metro depots such as Blackpool Tram to mainline depots, including the Ilford Crossrail depot and the recently completed GWR Exeter Depot, FirstClass can support you with any depot safety control system requirements.



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Presto Geosystems

3D Soil Confinement System Delivers on Tough Ballast & Yard Performance Challenges

Presto Geosystems' GEOWEB® 3D geocells technology has supported the rail industry for 40 years, for both new construction and repairs, even with challenging soft subgrades. The GEOWEB 3D system keeps infill confined and stable in the highest impact track areas and heaviest loading pavement areas.

When railroads encounter soft soils, they can halt operations and lead to costly downtime. Soft saturated subgrade under tracks causes speed

reduction and, in severe cases, even derailment. Right-of-way embankment soils that become saturated after storm events often cause washouts or slides, impacting rail line safety and operations.

Soil Stabilisation Technology

The GEOWEB (geocells) system's three-dimensional honeycomb structure confines and stabilises cohesionless soils, delivering strength and higher performance to soils than when left unconfined. The geocell technology is based on the interaction between hoop stresses in the cell walls and passive earth resistance of single or multi-layered geocell systems. Presto and their partners continue to lead research and development to advance cellular confinement technology for soil stability



challenges in a wide range of site applications and markets.

Challenge 1: Ballast Stabilisation

Typical Mainline Track Problems

Heavier loads, faster speeds, and new railcar design loads are contributing to more track issues. Mainline track and high-stress areas, such as bridge abutments, crossing diamonds, and turn-outs are experiencing issues with settlement, pumping, and

ballast contamination. All of these conditions can lead to increased maintenance and speed reductions.

Smart Ballast Technology

With aggregate fill confined within the GEOWEB 3D structure, the ballast layer is stable and reduces ballast pressure even under challenging soils and loading conditions. Confinement allows open-graded aggregate fill with low fines, facilitating good drainage and eliminating problems associated with poor drainage and saturated soils. Low-quality aggregate—even salvaged ballast—is commonly used for significant cost savings.

Accredited Testing Proves Performance

Rigorous testing at AAR TTCI and SmartRock™ testing at University of Kansas verified the GEOWEB 3D system's benefits, finding 'minimal movement and rotation' of the ballast and having a significant impact on reducing maintenance and extending ballast life.

Key Benefits Identified by Research

- Reduces ballast pressure & settlement (<50%)
- Reduces ballast movement, lateral spreading, abrasion and ballast attrition
- Reduces maintenance and tamping cycles



The same confinement benefits offer sustainable stabilisation of soil (topsoil, aggregate) on rail embankments and channels.

Challenge 2: Intermodal Yard Pavement Life-Cycle Costs

Class I Railroads and Short Lines utilise the GEOWEB 3D system for unpaved permeable surfaces in their yards, as well as in the base layer to stabilise and repair asphalt and concrete yards damaged by heavy loading stresses and harsh winter weather.

Key Performance & Cost Benefits

- Use of lower-quality aggregate reduces installation costs
- 3D confinement prevents infill movement that increases load-bearing capacity for paved areas in crane and stacked container areas
- Extends pavement life and decreases long-term maintenance costs

Fast Response for Emergency & Flood Repair

Be prepared to repair washouts and track issues quickly and economically with one solution. Fast to install without special equipment or labour; rail crews can deploy and install the GEOWEB sections efficiently and safely, limiting downtime of rail operations. Stock readily available allows for fast deployment by local railroad crews. Most repairs do not require large construction equipment.

Presto Geosystems offers a **free project evaluation service** to evaluate the unique needs of each project. Our recommendations will deliver a structurally sound, cost-effective solution based on three decades of accredited research and testing data.

Contact: Bryan Wedin, P.E.
e: bryan.wedin@prestogeo.com
p: 800-548-3424 | 1-920-738-1328
w: prestogeo.com/railroad_industry



ROCK RIPRAP IS NOT NATURAL.

Propex Has Nature-Based Solutions.

Learn about the sustainable solution that is stabilizing this slope at: PropexGlobal.com/Resources/RocksIsNotNatural.



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GEOSOLUTIONS

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Propex GeoSolutions

Mitigating Track Closures with Environmentally Friendly Slope Stabilisation

Stabilising slopes and landscapes that are adjacent to railways is essential for protecting and increasing the performance life of the railway system.

Engineered Earth Armoring Solution offers an environmentally-friendly solution to mitigate rail closures due to unstable slopes and erosion.

These systems have most commonly been used to protect roadways; however, this same

technology can be used to protect railways from slope instability. Propex Engineered Earth Solutions has been protecting and stabilising steepened slopes for over 20 years. With over 35 million square yards of successful installations, Propex can provide solutions to design for the most challenging of environments.

Multiple sections on Wolf Creek Road in Lane County, OR required stabilisation and erosion protection due to roadside slides. The contractor originally used gabion baskets on one section of the road but decided to try SCOURLOK® because it offers robust slope stabilisation and installs faster than other armouring options.

SCOURLOK is a versatile stabilisation system that features rigid and interlocking cells armoured with erosion protection from a highly UV-stabilised High Performance Turn Reinforcement Mat (HPTRM). The system is engineered to provide a vegetated gravity wall system that resists sliding and overturning for up to 75 years.

In only two hours, two people were able to install 23 metres of SCOURLOK. In comparison, it took six people the same amount of time to install just 4.5 metres of gabions. In addition to significantly reducing labour and installation costs, the length of time that the roadway

was closed during repairs was greatly reduced.

The SCOURLOK system features robust HESCO® units as used to protect military and civilian personnel in dangerous environments. These units are filled with soil and other materials and can easily be connected and contoured to accommodate projects of any size. Another benefit to using the SCOURLOK system on the Wolf Road project was that a mixture of dirt and rock left over from the road reconstruction was used to fill the SCOURLOK baskets. This material could not be used to reconstruct the road and would otherwise have been discarded. The ability to use this material saved the cost and time of hauling it offsite.

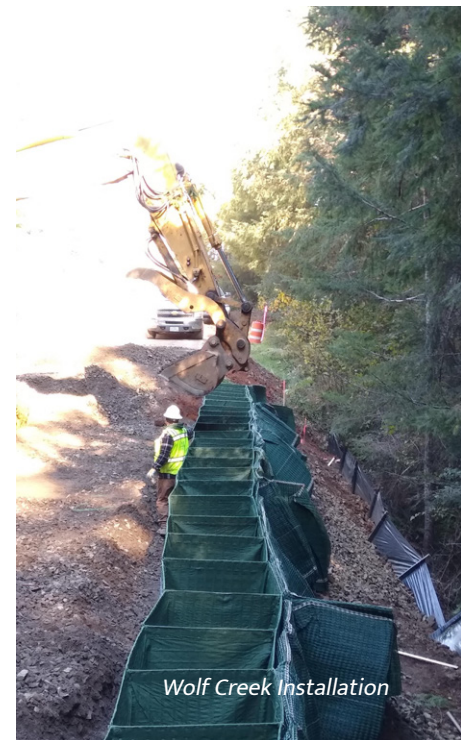
SCOURLOK also provides more environmental benefits than gabions and other alternatives such as rock and concrete. The HPTRM component of the SCOURLOK is engineered to lock seeds and soil in place to promote rapid root development for long-term vegetation. This technology has been recognised by the Environmental Protection Agency

(EPA) as a best management practice (BMP) to improve water quality.

Another environmental benefit of the SCOURLOK system is its small carbon footprint. One square metre of its HPTRM has a cradle-to-grave carbon footprint of 2.7 kgCO₂e. Comparatively, the carbon footprint of concrete and rock-based alternatives is up to 30 times higher.

Geotechnical slope failure and soil erosion can occur in any region. Steepened slopes often require stabilisation and protection from surface erosion. In some cases, when the slope is stable, protection from surface erosion is still required. The incorporation of an Engineered Earth Armoring Solution can assist in remediating geotechnical slope failure by passively resisting soil movement. Propex's solutions promote reinforced vegetation and are highly UV-stabilised to perform in the harshest environments, even when vegetation is sparse.

Propex's manufacturing facility houses the largest geosynthetics capacity under one roof,



Wolf Creek Installation

worldwide. This facility has the capacity to produce 400 million square metres annually, and currently ships to 34 countries across the globe.

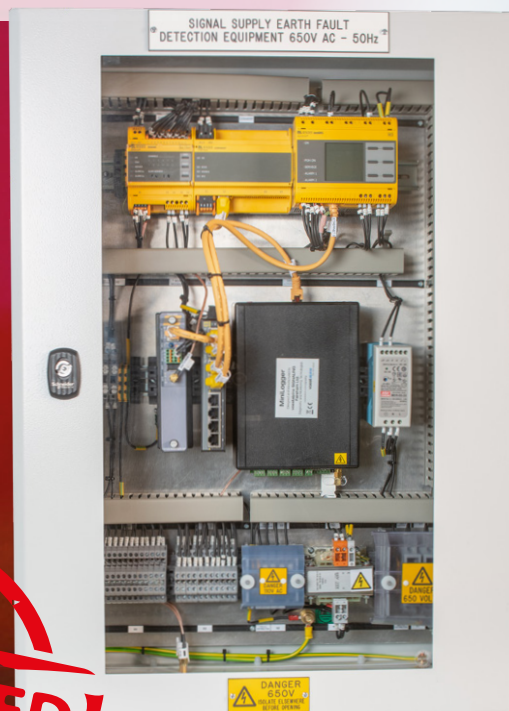
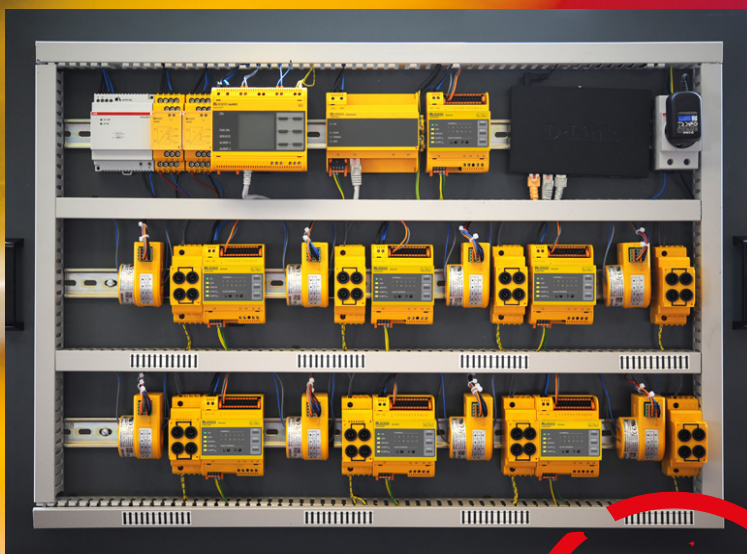
To learn more about SCOURLOK and our other solutions for slope stabilisation and erosion control, please contact Randy Thompson at Randy.Thompson@PropexGlobal.com



Wolf Creek Vegetation

RS4 Fault Location Signalling Protection Systems Tier 1, 2 and 3 Approved Solutions

- Insulation monitoring & earth fault location technology
- For total compliance with NR/L2/SIGELP/27725
- Increased sensitivity & improved fault location from 20K Ω to 100K Ω
- Easy to upgrade from previous device variants
- Compact for use in SIN119 remedial works



APPROVED

LOW VOLTAGE LIMITERS FOR RAILWAY VEHICLES IN DC SYSTEMS

protection of non-live parts of metal structures
in DC traction power supply systems

P60G, P120G - insulation resistance > 2 GΩ (outdoor and indoor use)
P60GI, P120GI - insulation resistance > 2 GΩ (indoor use)
P250G, P400G - insulation resistance > 1 GΩ (outdoor and indoor use)
P250GI, P400GI - insulation resistance > 1 GΩ (indoor use)

Acer Voltage has introduced a new type of low voltage limiters – 1 VLD-F Type, fulfilling the requirements of EN 50122-1: 2011, which are designed to protect the non-live parts of metal structures in DC or AC traction power supply systems. They are used to effectively protect people who may come into contact with these parts in case of lightning strike or in case of overhead line failure. The limiter has a high internal resistance when voltage on it is less than the nominal level of its spark over voltage U_{VDC} and becomes conductive when this level is exceeded. In case of failure caused by an accidental contact between live parts of the power system and traction conductor unintentionally in contact with return circuit, the limiter protects against electric shock by becoming conductive and causing the power to shut off. According to EN 50122-1: 2011, this type of limiter is recommended primarily for connection between the protected area and return circuit in overhead line areas (or pantograph areas) that may be in contact with live conductors or damaged current collector, then the support structures can become live due to a fault in isolation. After re-applied voltage drops below of its nominal level spark over voltage U_{VDC} the limiter returns to the non-conducting state again.



PROTECTION AGAINST ATMOSPHERIC AND SWITCHING OVERVOLTAGE IN DC SYSTEMS

protection of DC traction system, rail traction vehicles and equipment in DC systems

PSP */10/III - Line discharge class 3 (outdoor and indoor use)
PSPI */10/III - Line discharge class 3 (indoor use)
PSP */20/IV - Line discharge class 4 (outdoor and indoor use)
PSPI */20/IV - Line discharge class 4 (indoor use)

Overvoltage limiters designed to protect converter stations and DC networks of traction power supply systems connected to them against the effects of atmospheric and switching overvoltage. They are used for protecting traction lines, electrical equipment of trolleybuses and trams. They do not require any maintenance during their operational life. The functional part of the limiter consists of a column of varistors sized for continuous operating voltage U_c . The material of the housing shows high resistance to the effects of surface leakage currents and to electric arc, has hydrophobic properties and shows excellent resistance to weather, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSP series comply with the standards EN 60099-4: 2014, IEC 60099-4: 2014 and EN 50526-1: 2012.

PROTECTION AGAINST ATMOSPHERIC AND SWITCHING OVERVOLTAGE IN AC SYSTEMS

protection of high voltage transmission systems, transformers, switching equipment and HV cable systems

PSP */5 kA - Line discharge class 1 (outdoor and indoor use)
PSP */10 kA - Line discharge class 1 (outdoor and indoor use)
PSP */20/IV - Line discharge class 4 (outdoor and indoor use)
PSPI */20/IV - Line discharge class 4 (indoor use)
PSPI */10 - Line discharge class 1 (indoor use)
PSPN */10/III - Line discharge class 3 (indoor use)

Overvoltage limiters designed for protecting of high-voltage transmission networks; transformers, switching equipment and HV cable distribution systems against of atmospheric and switching overvoltage effects. The functional part of the limiters consists a column of varistors sized for max. continuous operating voltage U_c . The outer insulating shell is made from silicon material (grey colour). The material of the shell shows high resistance to the effects of surface leakage currents and to electric arc, possesses hydrophobic properties and shows excellent resistance to weather effects, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSP series conform to the standards EN 60099-4: 2014 and IEC 60099-4: 2014.

voltage in limits



PROTECTION AGAINST ATMOSPHERIC AND SWITCHING OVERVOLTAGE IN AC SYSTEMS

protection of LV outdoor lines, household connections, distribution transformer switchboards

SPB */10 PP* - on flat busbars

SPB */10 AlFe* - on bare overhead conductors

SPB */10 S* - on insulated overhead conductors

Surge arresters on flat busbars (SPB*/10 PP*) on bare overhead lines (SPB */10 AlFe*) or on insulated overhead lines (SPB */10 S*). Surge arrester as per EN 61643-11: 2012 with a nominal discharge current of 10 kA and a maximum continuous operating voltage of $U_c = 280 \text{ V}$, 440 V , 500 V or 660 V . They provide protection against low-voltage overvoltage, they protect in low-voltage overhead power distribution systems – electrical equipment, instruments, switching equipment of distribution transformers and reduce the risk of damage to in-house networks and their equipment by atmospheric and switching overvoltage in AC networks with a frequency of 48-62 Hz. The SPB surge arresters protect against the destructive effects of lightning and switching overvoltage. It is recommended to use them in places secured against contact, e.g. by secure installation location or physical barrier.



 Directory

< Infrastructure

Digital Interlockings in Germany

COVID relief funding and a new law to accelerate infrastructure projects mean that digital interlockings will exist nationwide in Germany five years sooner than expected, in 2035.

The work on the seven regional routes is being delivered by:

- Alstom
- Hitachi
- InoSig
- Pintsch
- Scheidt & Bachmann
- Siemens Mobility
- Thales Deutschland

Deutsche Bahn, the German rail industry (VDB) and the authorities are accelerating the digitalisation of the rail network. Seven regional routes will be equipped with digital

interlockings in 2021, replacing more out-dated technology. This will allow more trains to run on the existing infrastructure. It will also increase their reliability and punctuality.

The projects are being funded from the federal coronavirus relief funding, which is making an additional 500 million euros available. The Federal Ministry of Transport and Digital Infrastructure (BMVI) agreed on how to use the funds together with Deutsche Bahn and VDB in 2020.

100 million euros were used last year, a further 400 million euros will be invested this year. These upgrades will benefit both passenger and freight rail.

DB Netz AG has chosen seven companies to deliver the first contracts in the programme. This is delivering stable contracts for suppliers. Many innovations are

being tested for the first time, new businesses are entering the marketplace and standards are being established for the digital technology.

Ronald Pofalla, the Head of Infrastructure at Deutsche Bahn, said: “We’re going full steam ahead with our digital railway programme in Germany. Working closely with the rail industry we’re digitalising seven interlockings in seven regions of Germany. Passengers and freight operators will benefit from a larger and more reliable service on the rail network.”

The seven projects are:

1. Kleve-Kempen
2. Finnentrop
3. Ansback-Triesdorf
4. Wörth (Rhine) / Gemersheim-Speyer
5. Zwieseler Spinne
6. Gera-Weischlitz
7. Lichtenfels-Coburg-Sonneberg

Enak Ferlemann, the Parliamentary Secretary of State at the Federal Ministry of Transport and Digital Infrastructure, said:

“The digital railway programme in Germany is picking up speed. That’s unmistakable. Now we have to use the experiences from the pilot projects to reduce costs and construction times for the next digital interlockings. At the same time we’re looking at expanding the digital railway programme, for example in order to implement the Deutschlandtakt timetable even faster thanks to digital capacity management. In this way the digital railway programme is making an important contribution to our central policy for rail, which is to shift more transport to rail.”

Digital interlockings are at the heart of equipping the rail network with the standardised European Train Control System (ETCS).

Overview of the Seven Projects





Line D of the Bordeaux Tramway: Increased Availability Using Counting Head Control

How can tramway operators be supported to reduce disruptions during operations? Using an example from France, Frauscher shows how state-of-the-art solutions can increase the availability of a signalling system.

Trams have enjoyed an excellent reputation in France for several years. This is because intelligent concepts contribute to seeing trams not only as a mode of public transport but also as a gain in quality of life. To meet the high demands of citizens, the operator Keolis was actively looking for a customised solution for Line D of the Bordeaux tramway.

Together with its partner Vossloh, Frauscher France presented a solution to ensure the availability

and reliability of the signals even under difficult conditions, such as those that often occur on tram lines due to rubbish and metal objects (cigarette papers, soda cans, etc.). Furthermore, reliability must be ensured at any time.

Let's look at what the tram drivers have to deal with: in most cases, tram drivers drive on sight. This means that they are responsible for maintaining the required distance to the trams ahead. However, some circumstances make

technical support indispensable. For instance, switches and bi-directional parts of the line or single-track sections, require arrangements that must be made to avoid any risk of any trams meeting head-on. In these cases, using line of sight does not meet the safety requirements and thus technology supports the operation to manage the signalling function.

The advantages of the FAdC at a glance:

- State-of-the-art interface (fail-safe SIL4 Ethernet protocol)
- No trackside electronics
- No relays required
- Easy integration
- Increased reliability
- High availability
- A lot of additional information (including direction, number of axles and diagnostic data)

Safety First with SIL 4

According to the CENELEC standard for the railway industry, 4 different levels classify electronic systems in terms of the reliability of their safety functions. Line D in Bordeaux requires a system that meets the highest safety standard, SIL 4.

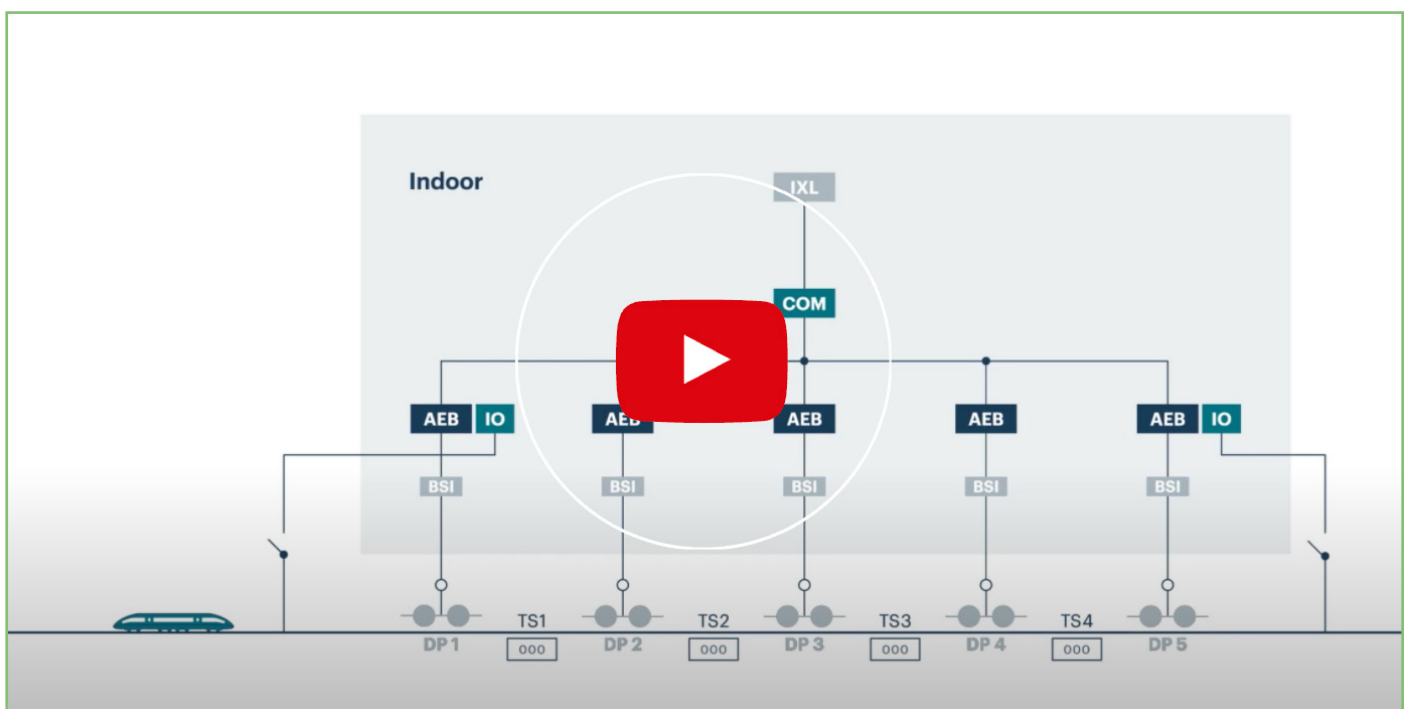
The combination of on-track sensors and their evaluation units installed inside cabinets meets this requirement and makes the Frauscher Advanced Counter FAdC system a safe package.

Metal on the Track? No Problem Thanks to Counting Head Control

The Counting Head Control CHC principle avoids error indications being generated by unavoidable factors such as metal objects. If the adjacent track sections are clear, the counting head is switched to standby mode. In this idle state, a freely configurable number of undesirable instances of damping can be suppressed. Short-term influences do not generate a malfunction or occupied notification: there is no need for a reset. Approaching vehicles switch off the standby mode, meaning that they are detected, and the occupied indication is output in a fail-safe manner.

Of all French tram networks equipped with a Frauscher axle counting system, the Bordeaux tramway is the first French tram system to benefit from this innovative concept.

Counting Head Control CHC: How does it work?



CASE STUDY: Installing an Interlocking System in Switzerland



In 2018, the Swiss company BÄR Bahnsicherung Ltd commissioned its first digital interlocking in Bellevue for the operator Chemins de fer du Jura in Switzerland

Over the past three years, since the company made the strategic decision to target the digital interlocking market, BÄR has managed to develop a safe solution to replace an old relay interlocking. This first success allowed the company to go forward and introduce the EUROLOCKING as a new competitive challenger on the rail interlocking market.

Alle-Centre and Vendlincourt in Switzerland

The new installation replaces the old relay signalling system at the Alle-Centre and Vendlincourt stations on the Porrentruy-Bonfol line, which is operated by Chemins de fer du Jura (CJ). The line is interoperable with a standard-gauge track and connected to the SBB (the Swiss national train operator) network in Porrentruy.

In 2020 the tracks of these two stations were totally renewed with an updated track layout.

The signalling system is now organised as a network interlocking with the option to manage additional stations. The central processing unit (CPU) is in Alle-Centre in a prebuilt technical room also was delivered by BAR Bahnsicherung Ltd.

Alle-Centre is a freight station with 3 main tracks and 4 auxiliary tracks. The EUROLOCKING in Alle-Centre monitors eight sets of points, five derailling devices, ten train signals, 15 dwarf signals and one level crossing.

Vendlincourt is a satellite of Alle-Centre. It is a passenger station with one track. The CPU from Alle-Centre monitors one set of points, six train signals, four dwarf signals and one level crossing.

Interfaces with Sub-Systems

EUROLOCKING is versatile and can work with different homologated devices from different suppliers. This project was developed with:

- First application with point machines AH-950 from voestalpine
- Axle counting system Frauscher FAdC with RSR-180 wheel sensors
- Track circuits (first use)
- First integration of a level crossing RGS-LC-06 from RGS Bahnsicherheitstechnik GmbH
- European Train Control System Level 1 (ETCS L1)

The new interlockings have been integrated into the existing centralised traffic control system.



EUROLOCKING

the versatile solution

The EUROLOCKING system complies with the requirements of EN50126, EN50128, and EN50129.

EUROLOCKING supports several different TCP/IP based protocols (up to SIL 4) for the communication within its components.

On June 12, 2020, the EUROLOCKING received from the Federal Office of Transport the type approval.

Components Inside the Technical Room

The core of the railway signalling system is in the technical room in Alle-Centre. The small pre-built room (less than 23 square metres) houses the EUROLOCKING cabinets.

The uninterruptible power supply (UPS), delivered by Benning, provides 400V AC, 230V AC and 24V CC to the whole railway signalling system: CPU, signals and point machines.

The autonomy of the UPS was optimised thanks to two separate power supplies:

- 230V 50 Hz coming from the local energy supplier
- 230V 16,7Hz coming from the catenary

Three cabinets make up the UPS system.

The EUROLOCKING system is made up of four cabinets. Cables from outside components are wired into the room on surge protectors. From there, inside wires go to the EUROLOCKING cabinets. Three panels along one wall of the technical room hosts the surge protectors interfacing the inside and outside wires.

In Vendlincourt, a small technical room houses the UPS, made up of three cabinets as well as two cabinets for the EUROLOCKING satellite.

Block System

The Porrentruy–Bonfol line has the following stations:

- Porrentruy (connection to the SBB network)
- Alle
- Alle-Centre
- Vendlincourt
- Bonfol

For the moment, only Alle-Centre and Vendlincourt were upgraded. The new EUROLOCKINGs have to operate with the adjacent old relay interlockings in Alle and Bonfol. This was made possible with a proven device: the relay block TMN from Siemens. Both sets of relay block are implemented together in the same cabinet instead of being on each side of the track. The relay sets are interfaced to the CPU with a peripheral PLC (SIL 4). This solution provides efficiency regarding the use of cables. The stations are linked with fibre-optic cable which is used for the block management. No copper cables are needed for the block.

In the second phase, when Alle and Bonfol will also be equipped with the EUROLOCKING system, the fibre-optic cables will be reused to manage the signalling in these stations. The relay block will also be replaced with the EUROLOCKING eBlock. That way, no copper cables are necessary for this temporary phase.

Next Steps

Over the coming years, Chemins de fer du Jura will commission several more EUROLOCKING systems. The stations of Alle and Bonfol will be part of this wave. The renewal of the rail signalling system, planned in two phases, demonstrates the flexibility of the EUROLOCKING system. By the end of January 2021, six railway operators have opted for EUROLOCKING and a total of 35 systems have been ordered.



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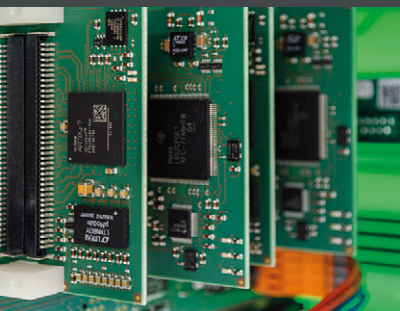


DIGITAL INTERLOCKING EUROLOCKING

Developed and engineered in Switzerland



SCALABLE | FLEXIBLE | MODULAR



From September 2018 until present, 8 systems have been commissioned.
27 additional systems have already been ordered through 2026.

With EUROLOCKING, we have developed a digital interlocking system of the latest generation based on a SIL 4 Programmable Logic Controller (PLC), which is freely scalable in size. EUROLOCKING can be used on standard and narrow-gauge railways as well as mountain and tramways. The structure allows centralised or decentralised interlocking architectures to be realised.

The use of **COTS**-Hardware (**C**ommercial **O**ff the **S**helf), which has proven itself in the process industry for years with the highest safety requirements and is manufactured in high quantities, offers cost advantages and reduces the susceptibility to errors compared to small series or individual production. In addition, the dependence on suppliers is significantly reduced, which leads to improved delivery readiness with lower lifecycle costs.



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BÄR BAHNSICHERUNG
SMART SOLUTIONS FOR SAFE RAIL TRAFFIC

DB AG / VDB e.V., 03/2021

ZÖLLNER

signal system technologies



We Design Your Track Safety Solutions

As the leading producer of warning systems for track construction sites, ZÖLLNER has been securing a wide variety of work sites and personnel around the world for over 25 years.

Our industry-leading technology has been used to protect both large teams working on complex track layouts as well as small teams and individual workers undertaking inspections and de-vegetation projects.

The modern radio technology based system MRWS (GB2) gives planners, managers and operatives the ultimate peace of mind that their work site and personal safety is assured, utilising the most current technology backed up by decades of on-track experience.

Protection can be provided utilising the well-established and proven hardwired Autoprowa system, the signal-controlled warning system, the temporary level crossing system or a combination thereof. No matter what the challenge is, ZÖLLNER offers a solution for every track construction site.

While the modular make-up of all ZÖLLNER systems allows for maximum flexibility, the SIL-certified warning devices guarantee maximum safety. Equipped with the Autoprowa-Effect, all warning devices continuously measure the surrounding noise and adjust the volume level of the emitted warning signal accordingly. This ensures that ZÖLLNER systems deliver the warning as loudly as necessary and as quietly as possible. The warning signal can clearly be heard over the surrounding construction noise, while ensuring the noise pollution for the environment and any residents is as minimal as possible.

SATWS and ATWS

In this configuration, the work site is protected by a rail-mounted sensor which can be either permanently or temporarily installed for longer or shorter-term works as required. The work site is then protected by, and warnings are given via the speakers and lights of the ZPW. Train warnings can be cancelled manually by an operative, making the system semi-automatic in nature (SATWS), or a second track detector can be placed past the work site automatically cancelling the warning (ATWS), reducing the need for any human interaction.

Large Work Sites

For larger work sites which may require a larger number of warning devices, multiple ZPWs can be used to provide warning signals along bigger stretches. The cancellation

of the warning can either be performed at one ZPW designated as the master controller or via a ZRC control unit. The deployment of a ZRC gives more flexibility in terms of the location of the controller of the system, as this unit can be worn on a harness and operated from anywhere within the work site.

Mobile Work Sites

Where the detection point needs to remain flexible, due to a moving work site for example, the warning can be triggered by an operative using a ZFS-10 as mobile hand switch which connects to a single or multiple ZPWs at the work site. Warnings are activated via two failsafe switches which alert the work site to an approaching train. Both the controller and operatives at the work site have peace of mind that the lookout is protected by an internal tilt and motion sensor in

the ZFS-10. This ensures that should the lookout become ill or unwell and is unable to operate their hand switch, a failsafe alert is sent to the work site, protecting the lookout as well as the track workers at the work site.

In the event of a work site having multiple lookouts, the continuous, bi-directional communication between all units ensures that the health, safety and welfare of all operatives is guaranteed.

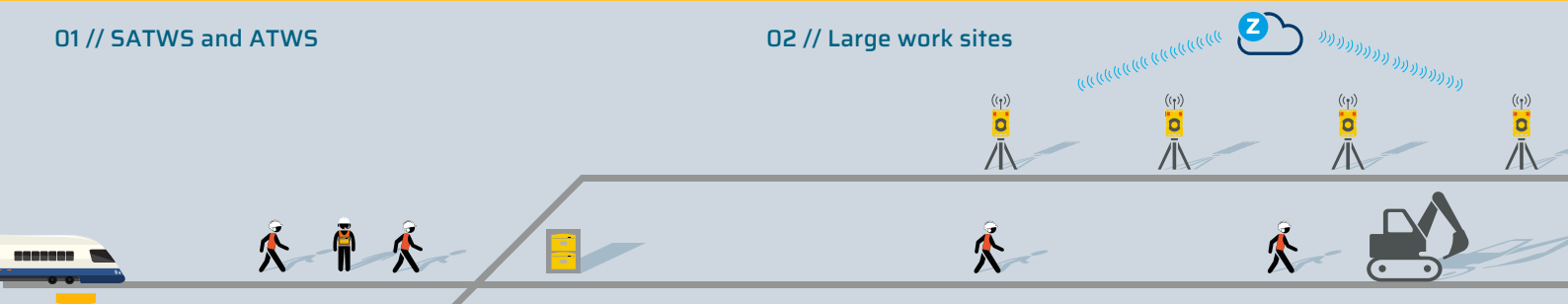
Machinery Warning

Track renewal, ballast cleaning or any other work sites where high-output machines are deployed can often mean the operatives are working in close proximity to noisy, fast-moving machinery.

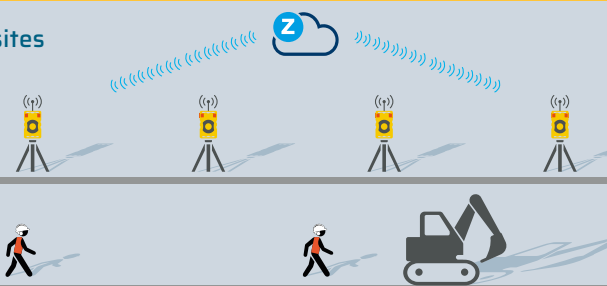
The most efficient way to protect the operative is via machinery-

Solutions for all kinds of track work sites

01 // SATWS and ATWS



02 // Large work sites



03 // Mobile work sites (LOWS)



04 // Machinery warning



05 // Personal warning

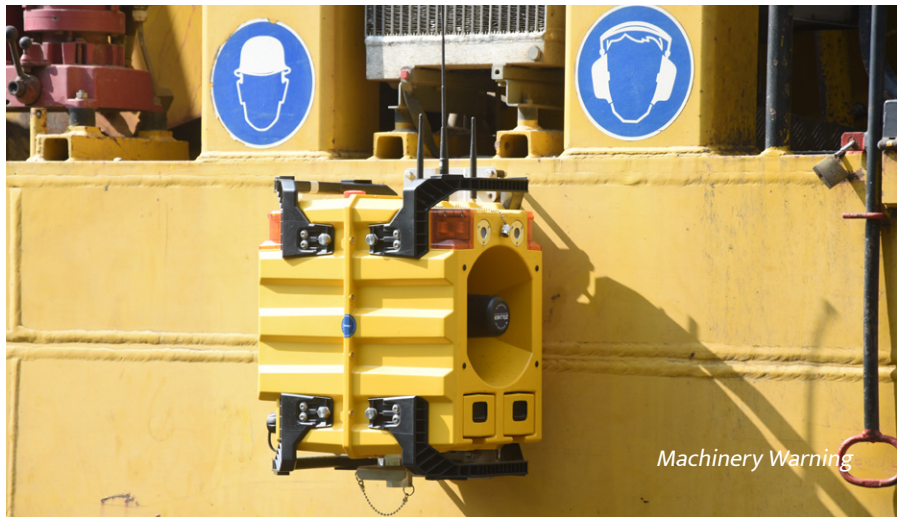


mounted warning devices. The ZPW126-10 warning devices are attached directly to the machine with a magnetic frame, alerting the operatives as the machine approaches and passes them.

Personal Warning

If the work site is particularly noisy due to the use of chainsaws or other high-volume machinery, ZÖLLNER's ZVW system gives the operative notice of the warning directly into their hearing protection via a backpack-worn radio receiver. Additional warning is given by visor-mounted LEDs which visually alert the operative of a train warning.

Other ZÖLLNER personal warning devices such as WADSON (Warning Device Snap On) are carried directly on the chest giving the operative an optical and acoustic warning (90 dB (A)). In addition to the train announcement our CLARIS system also offers communication between the safety staff and the operative.



Machinery Warning



Personal Warning ZVW and CLARIS



Wadson Warning

WATCH: The principle of the mobile radio warning system MRWS



Innovations of the Mobile Radio Warning System

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signal system technologies

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ZCloud – MRWS in the Cloud

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signal system technologies

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TUNNEL RADIO

Meets Underground RF Challenges

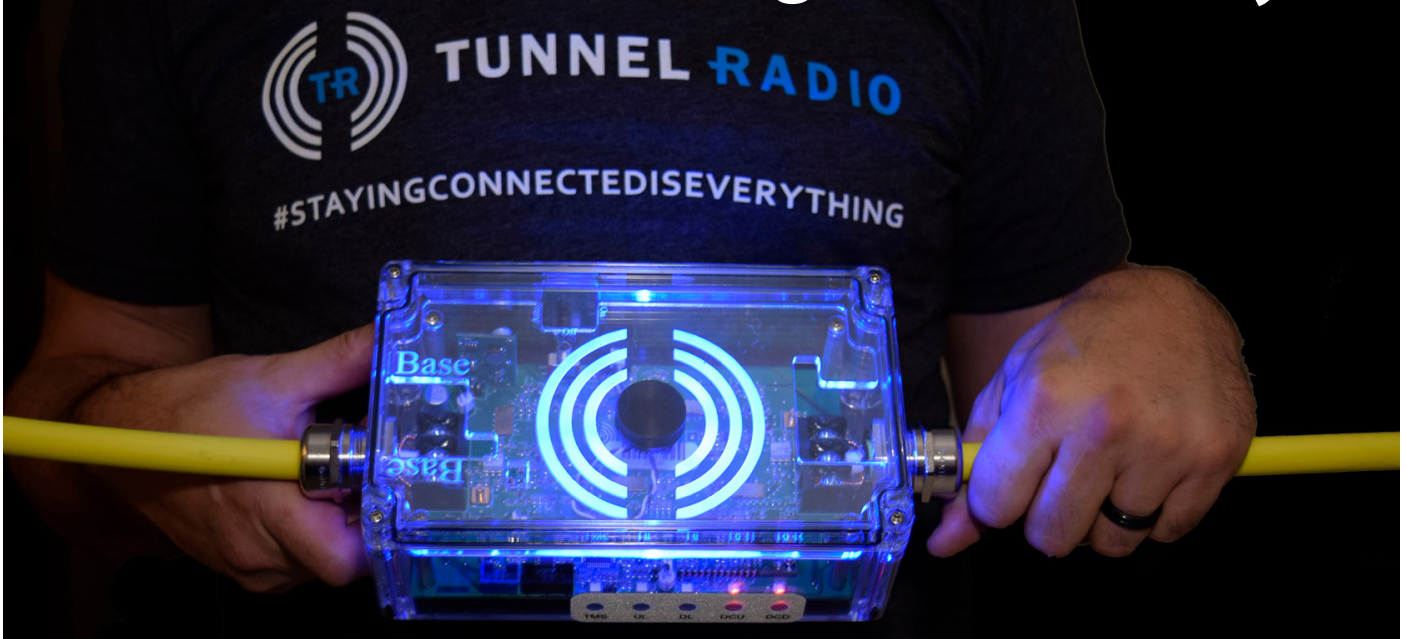
Connecting trains with Ultracomm[®] system in tunnels, underground, and other RF problem areas

- Train control connectivity for North American PTC, ETCS, TETRA, Distributed Power
- Mission critical data communication
- Radio/dispatch communication systems
- Personnel and equipment location system
- Leaky feeder amps for wet environments
- TRCentral[™] software
- Emergency services communications

30 YEAR LEADER IN UNDERGROUND COMMUNICATIONS
trsales@TunnelRadio.com | 541-758-5637 | Corvallis, Oregon, USA | tunnelradio.com

Tunnel Radio

Radio Frequency Challenges for Underground Railways



Wireless underground communication is more reliable with Tunnel Radio's TRCentral™ software

The wireless communications landscape is fraught with RF challenges. Safe and reliable technology solutions entail more than just an antenna and a wireless communication device. This is especially true in today's world of rail transportation. As trains become longer and faster, better data and voice communication becomes ever more important to safety and efficiency.

The development of railway RF system components, including radios, base stations and antennas

has made great strides over the past decade. The implementation of these advances has allowed trains to continue and improve their mission-critical communications. Tunnel Radio expertly manages these complex systems with its exclusive TRCentral™ software.

Features of TRCentral™ Software:

- Visibility of all installed networked systems simultaneously
- Works seamlessly with TMS-Net installations
- Monitors each amplifier's signal level, voltage and status
- Advanced alarm capability using quality-of-service metrics to identify degrading or intermittent operations
- Performance data captured, stored for 30 days, archived and graphically displayed
- Email/SMS notifications of warnings and alerts
- Mobile friendly, web-based user interface
- 24/7 technical support



Tunnels Aren't the Only Obstacles

Going underground isn't the only source of problems for wireless connectivity. The increasing length of trains creates connectivity issues too. Dual-power communications enable HOT-EOT connectivity, ensuring safety and improving locomotive efficiency.

Additionally, dense foliage abutting the right-of-way and tight turns on narrow canyon passes can cause low to zero propagation areas. In locations ranging from the heavy vegetation of the Brazilian jungle to the steep canyons of the Tehachapi mountain range in California, extending RF-based coverage is a necessity.

Leveraging a Modular Leaky Feeder Foundation for Other Critical Functionalities Is Key

A modular and reliable communication system is a key building block to future-proofing the system. Modularity gives the railway operator the option to leverage their existing installation towards later needs. For instance, personnel proximity and location tracking can be installed as an overlay to a comms-only system. Back-office monitoring systems



Above: TR-On-Frequency Amplifier

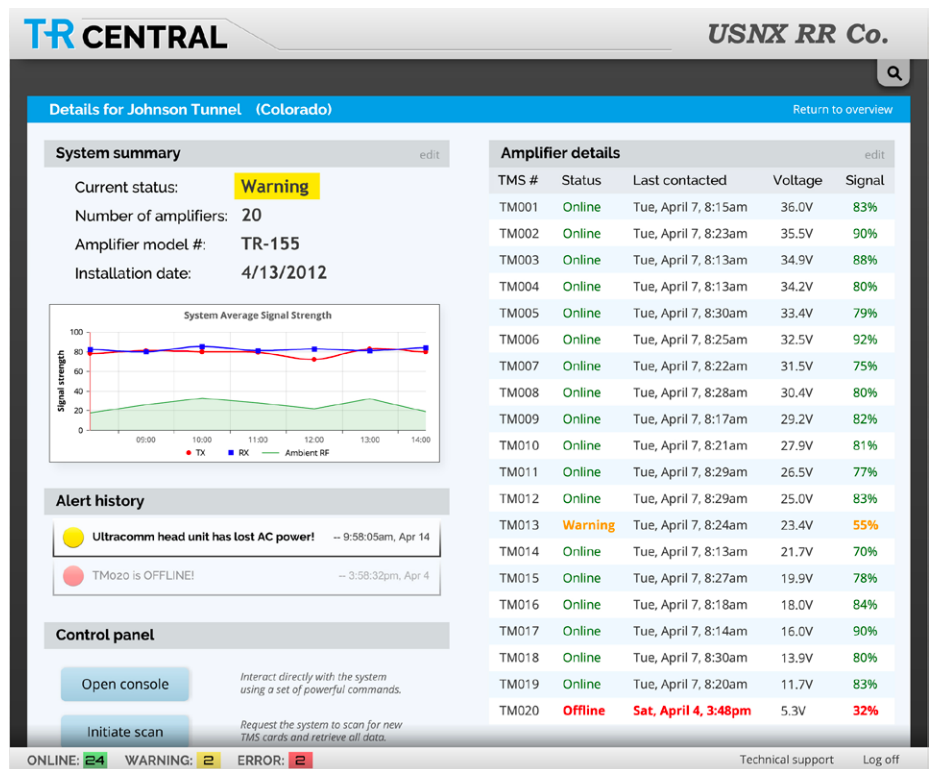
that provide real-time alerts about equipment location and maintenance crews allow the railway operator to identify potential conflicts between operating trains and active work zones. TR systems even have the capability to support various SCADA control signal connectivities. All of this is monitored with TRCentral™ software.

High Reliability and Connectivity Does Not Always Mean High Cost

While difficult challenges create a need for adaptive and comprehensive solutions, new or cutting-edge technology isn't always the best answer. Proven and established technologies often provide a better, more cost-efficient approach.

Leaky feeder has been around for decades. By combining it with digital data and voice radios, railways can reduce the cost of implementation and maintenance. Today's leaky feeder technology also offers modularity options that expand its reach even further. The result: lower budget requirements for new installations, and reduced maintenance costs for existing installations due to longer maintenance cycles and fewer deployed devices per kilometre than other technologies.

Tunnel Radio's Tunnel Link™ system employs a distributed antenna system, consisting of a radiating coaxial cable and digital amplifiers that provide a signal extension. Tunnel Link's unique design handles high-speed asynchronous data in simplex mode at very low distortion figures, suitable for use with FSK or phase shift complex modulation schemes used in today's modern



Below: Tunnel Radio's rugged leaky feeder amplifiers are reliable and efficient



digital communications. This design also negates any need for multiplex equipment. The amplifiers are ruggedised, and component count is low. The built-in diagnostic and monitoring system allows local and remote use.

Planning for the Future When Buying Today

Designing systems that are adaptable to future technology requirements is one way of ensuring usability for the long term.

Well-designed RF systems are integrative and interoperable now and in the future. Conforming to EN, FRA, IEEE, IRIS and other recognised

Sample screen shot of TR Central software

conformity specifications adds insurance that products will be safe for end users.

Technology with Customer Support

Finally, having qualified technical support available 24 hours a day, 7 days a week is the keystone to a successful RF-challenged remediation. Many OEMs and suppliers forget that railway operators do not have time for scripted call centres with 9–5 hours. Immediate-need customer support via voice, video and email, minimises downtime for railway operators, thus reducing negative cost impacts and operational delays.



www.tunnelradio.com/railroad

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Connect Assets on the Move When Reliability Is Critical

Fluidmesh Renamed ‘Cisco Ultra-Reliable Wireless Backhaul’, Wins 2021 IoT Breakthrough Award



By Umberto Malesci

Asking what’s the best wireless technology is like asking what’s the best pasta shape. Answer: it depends. For pasta, the variable is the sauce—tubes for chunky sauces, strands for oils or creamy sauces.

For wireless technology, the best choice depends on your application (tolerance for latency, packet loss, and dropped connection) and assets (where they are and how fast they’re moving). Based on those answers, you might be best off with Wi-Fi, LoRaWAN, public or private LTE, Wi-Fi 6, or 5G where it’s available. Cisco has solutions for all of these options.

But none of the wireless technologies I’ve listed above reliably connect *assets on the move* to *critical applications* that can’t tolerate packet loss or latency of more than a few milliseconds. To understand why that’s important, imagine remotely monitoring and controlling moving assets on trains, subways, public transit, mines or

ports. If a few packets drop while you’re checking email, no one notices. In contrast, a dropped packet when you’re remotely controlling an autonomous vehicle can have serious consequences.

IoT Breakthrough Award

To provide ultra-reliable, low latency connectivity, Cisco acquired Fluidmesh **in July 2020**. The market intelligence firm IoT Breakthrough gave a shoutout to the acquisition by naming us the “M2M Network Equipment Company of the Year” in 2021. Now in its fifth year, the IoT Breakthrough Awards programme recognises innovators, leaders and visionaries from around the globe



in multiple IoT categories. We're pleased to have been selected for the award from a field of more than 3,850 nominees around the world.

Fluidmesh Renamed Cisco Ultra-Reliable Wireless Backhaul

To highlight what makes Fluidmesh unique, we're changing its name to Cisco Ultra-Reliable Wireless Backhaul. New name, same specs. Up to 500Mbps dedicated bandwidth. Negligible latency. No packet loss during handoffs even when assets are moving at up to 350km/h (217 mph). Five-nines availability. And no service provider fees, because you own the network.

James Johnson, managing director of IoT Breakthrough, spelled out the innovation when he said, *"Cisco Ultra-Reliable Wireless Backhaul extends the company's leadership in industrial wireless to include on-the-move applications where reliable backhaul is mission critical."*

In Action

The best way I know to show how Ultra-Reliable Wireless Backhaul is transforming operations is to point to our customers. In Lyon, France, rail operator SYTRAL is improving passenger safety by monitoring feeds from more than 1000 IP cameras—at any train speed. Malta Freeport Terminals

controls cranes and yard equipment up to 800 metres away at 50 to 60 Mbps—with zero packet loss. In Milan, Italy, Hitachi Rail (previously Ansaldo STS) runs a completely driverless metro line enabled by communications-based train control (CBTC). Other customers use our Ultra-Reliable Wireless Backhaul for remote machine operations, SCADA backhaul, and emergency response systems.

Like pasta recipes, new use cases just keep emerging.

I invite you to learn more about Cisco Ultra-Reliable Wireless Backhaul at www.cisco.com/go/wirelessbackhaul.

www.cisco.com/go/transportation



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COMMSCOPE®

The Importance of in-Train Mobile Coverage

How to provide reliable in-train wireless coverage – a key requirement for passengers today.

As smartphones and tablets have become ubiquitous, people expect to stay connected wherever they are; whether that's sitting in a local café enjoying a coffee or on a train travelling to work.

Mobile coverage on trains is now a key requirement for passengers. Understandably so, as a high percentage of rail passengers are business travellers who want to make the most of their commute. They want reliable voice and data coverage, and rail operators that consistently provide this will be their preferred choice for travel.

In order to offer an attractive product for passengers, rail and mobile operators are looking to implement high quality wireless in-train coverage solutions, but this doesn't come without its challenges.

Mobile Operators' Macro Networks

In order to enable mobile coverage inside a train, mobile operators have to provide outside coverage of the rail tracks. In an ideal case, the signals would be strong enough to penetrate the windows into the car body, so that travellers could use their mobile devices as they would outside the train.

However, this is usually not the case, especially outside of urban areas. Due to the fact that mobile macro networks are in most cases not or only partly designed to provide coverage for rail tracks, we see a variety of signals with different levels and quality along tracks. This is especially true in rural areas, where signals are often not strong

enough to be received inside the train.

What Can Be Done on the Tracksides?

There are several ways you can improve the situation tracksides.

These include:

- Optimising existing macro networks for better rail track coverage.
- Closing coverage gaps in tunnels by using optical distributed antenna system (DAS) systems to distribute mobile operators' frequency spectrums.
- Creating dedicated track coverage layers for all mobile operators, by sharing the base

transceiver station (BTS) or node locations along the tracks with the same power levels transmitted through shared antennas.

- Creating long cells with dedicated trackside DAS systems for seamless capacity distribution of all mobile operators' signals. This model, which is typically used to extend coverage and capacity into tunnels, could also be a valid approach for selected rail tracks.

Penetration Loss

Overcoming signal penetration loss into a train is another important challenge to consider. Modern trains' metallicised, anti-UV windows can reduce the signals by up to 35dB. This can result in bad call quality or dropped calls, reduced or even no data throughput in case of network fallback into 2G.

How to Solve This Onboard the Train

On-board repeater systems take the signal spectrum from outside the train and amplify the filtered frequency bands into the train through a dedicated antenna system, which can be a leaky feeder cable or antennas. The aim is to compensate for the penetration loss of each train type as specified by the mobile operators' guidelines and rules for such installations.

In many cases, a single repeater serves one train car only. However, a single repeater system may be able to cover additional cars, as long as the coverage targets are met and accepted by the mobile operators.

Node AM Onboard Coverage Solution

Node AM is CommScope's digital repeater for in-train coverage, providing a universal, multiband, multiservice solution, whether your requirements call for 4G (LTE/LTE-A), 3G (UMTS), or 2G (GSM, GPRS, EDGE), or a combination of all.

5G in the low and mid legacy FDD bands and NB-IoT are both supported today using dynamic spectrum sharing (DSS), while 3.5GHz TDD support is currently under development.

Node AM's modular, scalable architecture allows users to quickly modify, upgrade or expand the supported frequencies of the system.

Features and benefits include:

- The support of up to eight frequency bands in a single 4 HU chassis with a fully integrated multiband combiner and modem for remote monitoring and control.
- Subband-selective automatic gain/power trailing allows the repeater to adapt to its environment accordingly, preventing interference with nearby base stations and ensuring signal quality in rural areas where network facilities are limited.
- Flexibility on changing the repeater configuration while travelling internationally based on received GPS position.
- Intuitive auto-setup wizard and help screens enable easy system configuration and minimise setup time and reliance on expensive, bulky test

equipment.

- Advanced measurement features and statistics logging.
- Seamless integration with A.I.M.O.S.; CommScope's integrated management and operating system, helping you to operate your repeater and DAS network efficiently.

ERA DAS Solution for Rail Tunnels and Tracks

CommScope's expertise has helped DAS evolve from a static, niche product into a dynamic, responsive solution for connecting voice and data, poised to take advantage of 5G networks – even at bullet-train speeds.

Its latest DAS, ERA, is suitable for 2G,3G, 4G and 5G networks. Built on a digital solutions architecture that consolidates and simplifies DAS head-end resources, the system uses a simple drag-and-drop software interface to flexibly allocate capacity where and when it's needed.

CommScope – Europe's Leading in-Train Wireless Solutions Provider

For operators wanting to implement a high quality, in-train wireless solution, look no further than CommScope.

Our extensive portfolio of wireless in-train solutions is built on decades of industry leadership and experience in radio planning, project management and systems engineering. Why not **get in touch with us today** to see how we can help you?



CommScope wireless railway solutions keep your trains connected anywhere, at any speed.

Through even the longest tunnels CommScope expertise has you covered.

Wireless solutions for railways must deliver exceptional coverage and capacity wherever trains go. That's why, railways all over the world count on CommScope's expertise to keep their trains connected under any conditions, at any speed.

Our extensive portfolio of wireless in-train, station and tunnel coverage solutions is built on decades of industry leadership in wireless technology. CommScope's expertise has helped Distributed Antenna Systems (DAS) evolve from a static, niche product into a dynamic, responsive solution for connecting voice and data, poised to take advantage of 5G networks — even at bullet-train speeds.

[Learn more at commscope.com](https://www.commscope.com)

COMMSCOPE®

NEXT SENSE

part of Hexagon

Equivalent Conicity – Determining One of the Most Important Safety Parameter in Railways



What do rolling stock or infrastructure maintenance engineers have in common with vehicle developers and derailing analysts? They all put a lot of weight on the parameter of equivalent conicity. Because this parameter is so relevant to safety, calculating equivalent conicity is quite complex. A powerful tool enters the game with the CALIPRI measurement module for equivalent conicity.

As unpleasant as the thought of a derailed train is, this potential thread is the driving force behind the calculation of equivalent conicity. To understand the parameter and interpret its value, there needs to be a basic understanding of how a train moves.

The Sinusoidal Motion

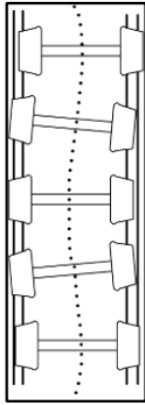
The train moves in a sinusoidal motion due to two characteristics

of the wheel-rail interaction. First of all, the geometry of the wheel is a conical shape, although it is much more complex. As soon as the train is set in motion, this conical-like shape induces a sinusoidal motion pattern as shown in the drawing below.

This motion pattern requires a track gauge that is slightly broader than the back-to-back distance of the wheelsets – otherwise there would be no space for the wheelsets to move left and right. The importance

of this way of moving forward becomes significant when thinking about taking a curve. Naturally one wheel – the outer wheel - will have to drive a longer distance, thus having to drive faster than the inner wheel with the shorter distance.

This effect, by the way, also occurs with cars. While a car makes use of the differential to balance the rotational speed of the wheels in a curve, a train makes use of the conical shaped wheels.



SINUSOIDAL MOTION
typical motion pattern



Equivalent Conicity

So, what exactly does the equivalent conicity (EC) parameter tell us? The name itself derives from the geometry of the wheel: the equivalent conicity defines to what extent the motion behaviour of a rail wheel equals a conical shape. In other words, the equivalent conicity tells us how fast the wheels are oscillating with a sinusoidal motion to the side.

As explained in our last article **“The role of the rail in the wheel-rail-interaction”**, the touching point between wheel and rail is actually a very small point – in order to avoid too much friction and energy loss during movement. With the sinusoidal motion of the wheels, this touching point moves within a certain area of the wheels surface. Determining this touching point and its area of movement is one key statement of equivalent conicity.

Calculating Equivalent Conicity

The equivalent conicity is a crucial safety parameter and therefore is calculated based on two standards, namely UIC 519 und EN 15302. While calculation methods may vary

between measurement systems, the key criteria stated in the norms always need to apply. Contrary to many other measurement systems on the market, the CALIPRI systems use non-linear differential equations instead of regression. Simply because this is more precise.

The underlying formula used in the CALIPRI measurement systems is called Klingel's formula. It describes the frequency with which a train moves left and right. Logically, the swinging frequency should be kept to a minimum. After all, a small frequency is characterised by a steady and stable train movement. Consequently, a low equivalent conicity value is desired. A high value, on the other hand, could indicate the danger of instable movement which in worst case can lead to a derailment. Especially for trains moving at a high speed, equivalent conicity has become a crucial parameter. In practice this means that the parameter can be used to determine a critical speed of a train at any location of a track (curve or straight).

In order to determine the equivalent conicity with the CALIPRI handheld device, key parameters of rolling stock and infrastructure need to be at hand:

- Wheel profile (left and right)
- Wheel diameter
- Back-to-back distance of wheels
- Rail profile (left and right)
- Track geometry
- Rail cant

The advantage of the CALIPRI system is that the underlying data can be a combination of currently recorded measurement data, previously collected and stored measurement data or reference data. E.g. a railway engineer in a train workshop can measure all rolling stock parameters and add the standard reference data for infrastructure. The same goes the other way around. It is also possible to work with reference data only, such as vehicle developers might do for example.

Interpreting the Data

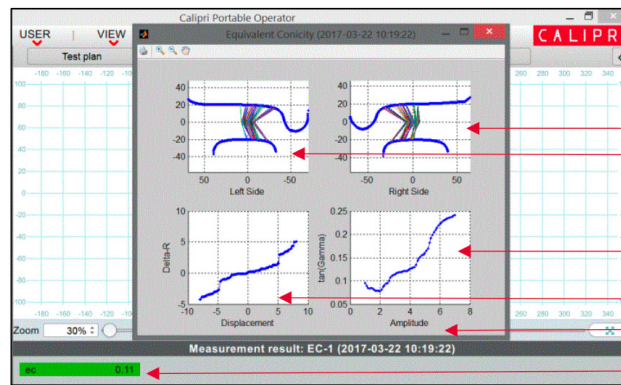
Equivalent conicity is a very powerful parameter with a lot of informative value, given the person reading it is able to interpret the data. In general, it is preferable for the EC value to be small but never cross a certain lower threshold, because this again could cause a train to derail. A typical cause of an EC value that is too small would be a hollow tread of the wheel. On the other hand, minimum EC values are

required for trains running through curves. The smaller the radii of the curves the higher is the required EC value.

But equivalent conicity is more than just a value, at least when it comes to the CALIPRI measurement system. Here the EC measurement module adds four graphs to the calculated value, giving extra data to interpret (see figure below).

The upper two graphs visualise the touching points between the wheel and the rail during movement (left graph showing the left wheel, right graph showing the right wheel). The graph in the lower left corner shows the wheel diameter difference between the left and the right wheel during the sinusoidal motion.

When the train stands still and centred within the track, this displacement is zero. The lower right graph puts the calculated EC value in relation to the actual amplitude of the movement within



CALIPRI MEASUREMENT MODULE „EQUIVALENTCONICITY“

- Contact graphs
(Wheel/Rail)
- Equivalent Conicity
- Wheel Diameter Difference
- Calculated Conicity Value
at 3 mm
(depending on the
underlying norm)

the track. Here the x-axis defines the wheel movement within the track in millimetres and the y-axis is the associated EC value.

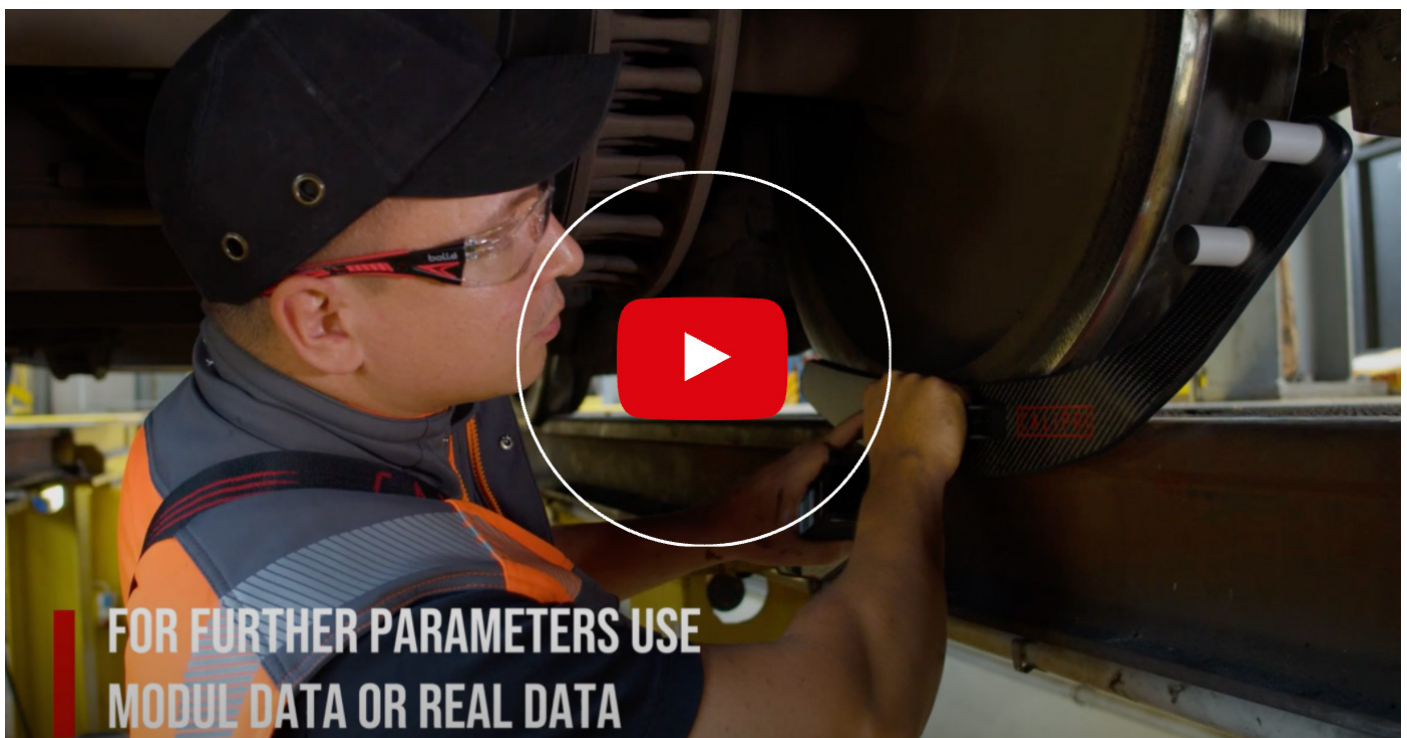
A typical movement of the wheels within the track is 3 millimeters. At this Amplitude the according EC value in the figure below (green field) is 0.11. Interpreting this value means: A wheel that moves about 3 millimeters left and right, equals a conical shape with an angle of $\tan(\text{Gamma}) = 0.11$.

Conclusion

Whether operators work in infrastructure, rolling stock, vehicle development or as derailling analysts, the CALIPRI measurement module 'Equivalent Conicity' offers highly precise results for in-depth analysis of this crucial safety parameter.

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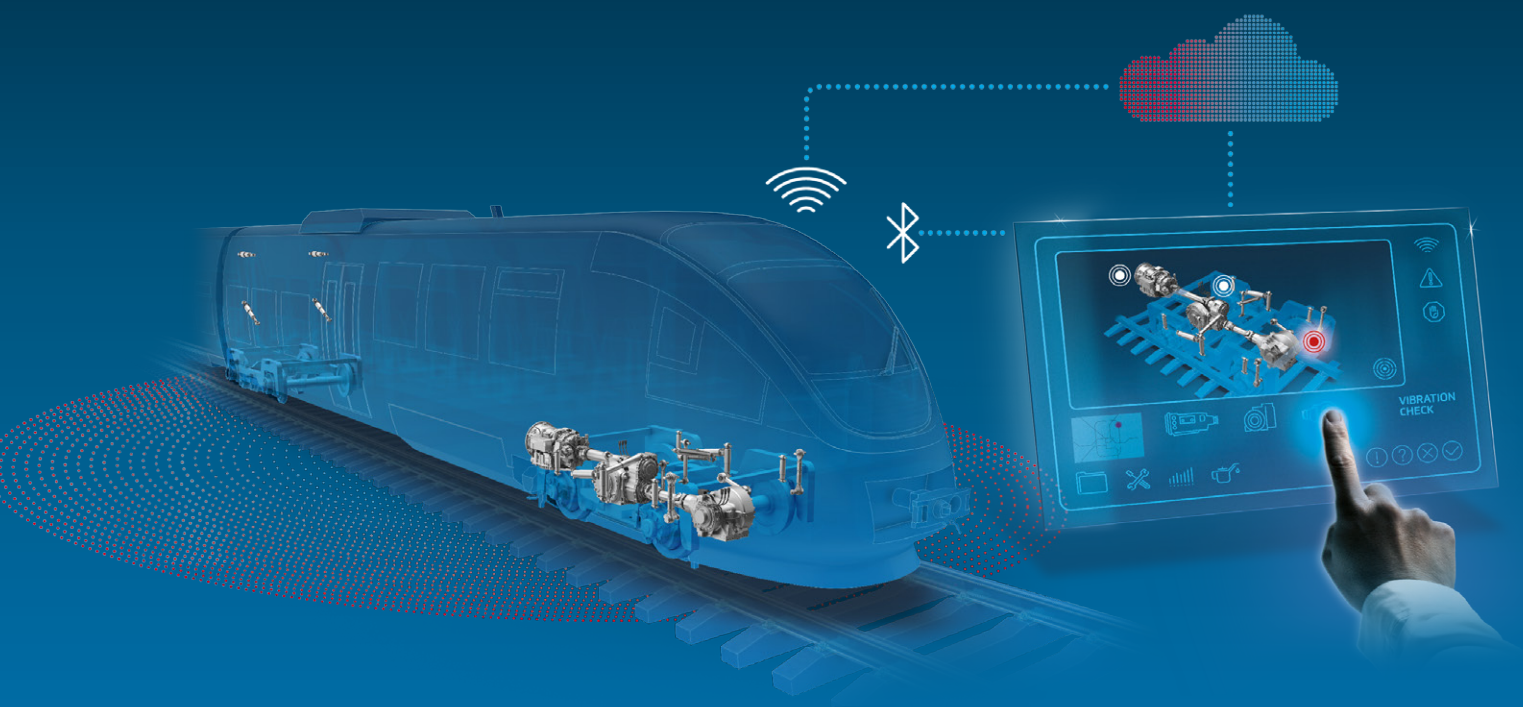
Video: CALIPRI C42 Equivalent Conicity



Your next connection: connect@rail

The intelligent condition monitoring system connect@rail demonstrates how integrated sensors and advanced data analysis tools can further improve efficiency, reliability and safety in rail transport.

www.zf.com/rail



For more information:
www.zf.com/rail



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ZF

Friedrichshafen AG

connect@rail – A Condition Monitoring System for Rail Vehicles and Infrastructure

ZF is one of the world's technology leaders when it comes to driveline, chassis, and safety technology for rail. It offers components and systems that make railway traffic more powerful without neglecting passenger safety and comfort.

Based on over 90 years of the Group's experience, manufacturers and operators of rail vehicles can profit from innovative and sustainable solutions for the mobility of today and tomorrow.

Comprehensive Condition Monitoring of the Future

With the intelligent condition monitoring system connect@rail, ZF demonstrates how integrated sensors and advanced data analysis tools can further improve efficiency, reliability, and safety in rail transportation.

Various sensors installed on the bogie record acceleration, tilt and vibrations in the wheel-rail contact during operation. Then, a digital platform developed by ZF reliably transfers the collected data and information to the ZF IoT cloud. The analysis and recommended courses of action based on the collected data are made available to the operator from the ZF IoT cloud, on a user interface and via push message. Thanks to this, they can optimally schedule maintenance dates and respond to the most diverse situations individually and

flexibly. This guarantees that the entire fleet is operating smoothly and as cost-efficiently as possible.

Infrastructure and Driveline Monitoring

The infrastructure and driveline monitoring system is one component of the innovative connect@rail system. After successfully piloting and pre-producing applications, the condition monitoring system is set to go into volume production.

In 2019, ZF started an extensive test campaign together with Graz Linien, first customer of the digital solution, to test the condition monitoring system. As part of this test campaign, two serial rail vehicles were fitted with the ZF hardware and the rail tracks were prepared, to gain in-depth data about different conditions. Today, ten Graz Linien vehicles are equipped with the infrastructure and driveline monitoring system.



Video: ZF during the extensive test campaign with the Infrastructure and Driveline Monitoring System in Graz, Austria

First Application: Flat Spot Monitoring

As a first step, Graz Linien is focusing on the detection of wheel flats. When exceeding the friction limit between wheel and rail, a flat spot occurs. In further operation, the wheel does not roll correctly on the rail, which causes excessive local material removal and further damage to bogie components. Flat spots are a possible reason for noise pollution for passengers and residents as well. With the infrastructure and driveline monitoring system, ZF provides an efficient basis for the early identification of flat spots and predictive maintenance planning. This reduces the impacts and comfort restrictions for people and the environment caused by this issue.



Equipped with the innovative infrastructure and driveline monitoring system: the Graz tram in ZF livery on its route through the centre of Austria's second-largest city

Flyer

Condition Monitoring
for Rail Infrastructure

ZF Friedrichshafen AG

Industrial Technology
Marine & Special Driveline Technology



rail@zf.com



+49 7541 77-3694



www.zf.com/rail





Autonomous Track Inspection

Decreased derailment risk.

Increased efficiency.

Lower costs.

ENSCO Rail is the premier provider of autonomous inspection systems that identify defects early and improve rail network safety – at the lowest cost per inspection.

www.ensco.com/rail

The bottom half of the image shows a blurred, high-speed train at night, with its headlights and taillights creating long, bright streaks of light. The train is moving along a curved track, and the background shows the blurred lights of a city or industrial area, creating a sense of motion and speed.

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ENSCO Rail

Keeping the Rails Moving Safely and Efficiently

The railway industry is entering a new era of next-generation track defect detection and software analysis capabilities that optimise railway maintenance and renewal planning, reduce risks through earlier identification of track defects, and improve rail network safety.

Data Collection: Autonomous Systems Offer a Highly Efficient Solution

Today, autonomous inspection systems provide reliable, fully

autonomous inspection installed on passenger or freight cars used in revenue service.

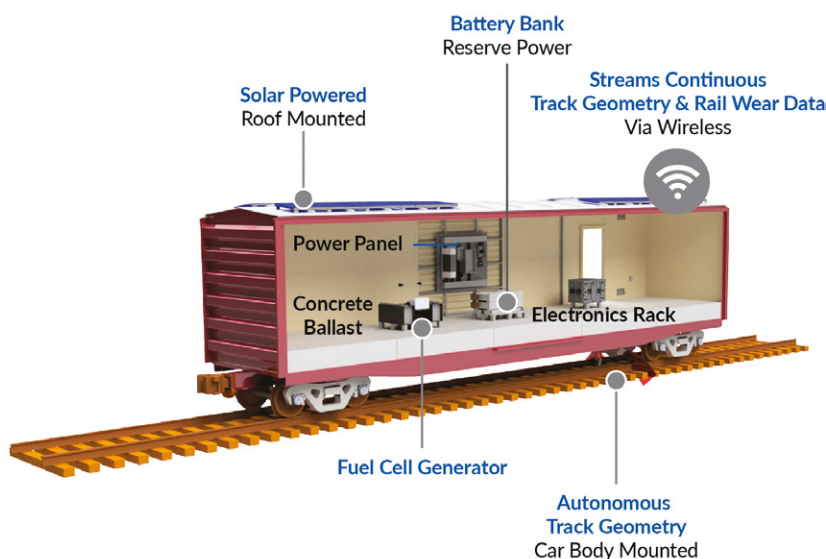
One of the most significant advantages of autonomous inspection technology is that every movement of the host train offers an opportunity to evaluate the

track, allowing for more frequent inspections without track time being consumed by dedicated inspection vehicles.

The ENSCO Rail Autonomous Track Geometry Measurement System (ATGMS) uses the latest fully digital, non-contact measurement technology employed by traditional manned track geometry systems. Measurements are performed every 250mm, up to the maximum speed of the vehicle, and can be performed in either direction. The ATGMS provides real-time transmission of continuous metre-by-metre measurement data, as well as exception processing in accordance with the automatically determined class of track.

More Reliable Detection through Artificial Intelligence

One inherent challenge faced by



The ENSCO Rail Autonomous Track Geometry Measurement System increases network safety and has the lowest cost per inspection

traditional autonomous track measurement systems is that certain conditions or track features can mimic defects, when in fact, track conditions are normal. To remedy this, ENSCO Rail developed advanced artificial intelligence algorithms that recognise and filter out these false exceptions. The algorithms are based on human data editors from thousands of miles of actual survey data, from which the ENSCO Rail algorithms learned to edit out false exceptions for real-time reporting.

Big Data Analytics Offer Condition Trending and Data-Driven Maintenance Planning

Maintenance is a necessary and significant expenditure by railway

personnel. Taking a proactive approach to maintenance and asset planning can yield significant savings by reducing manual condition data analysis and unnecessary maintenance expenditures.

New asset condition technology that relies on artificial intelligence, machine learning and data analysis offers the potential for significant reductions in maintenance costs every year while increasing operational capacity through accurate application of maintenance tasks.

The ENSCO Rail Automated Maintenance Advisor (AMA) automatically identifies areas of poor track performance, determines trends in track condition-deterioration and translates that data into prescriptive maintenance

tasks, resulting in proactive and data-driven track maintenance-planning and sound, efficient maintenance decisions.

Fully automated and cloud-based, the AMA is flexible and configurable to railway customer deterioration trending needs. It operates automatically, routinely assessing track condition data and recommending maintenance tasks based on a specified maintenance strategy. Asset management plans include rail grinding, rail replacement, ballast renewal, tamping and turnout maintenance requirements.

Visit www.ensco.com/rail and follow us on [LinkedIn](#) to stay up-to-date on the latest innovations in rail safety from ENSCO Rail.

Check out this short video to learn more about ENSCO Rail autonomous inspection!



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Smart Rail – High-accuracy ASC Sensors Ensure Safe and Comfortable Train Operation

Without inertial sensors, modern rail transport would be inconceivable.

Inertial sensors perform numerous important tasks in the development and operation of trains. One of them is high-precision measurement of oscillations and vibrations on rolling stock, tracks and bridges. The data obtained from these measurements form the basis for safe, comfortable rail transport. Engineers can draw valuable information from them for train design and infrastructure maintenance. Sensors also ensure that the train dispatchers at the railway control centres – such as with our client Deutsche Bahn – always know the exact location of any given train. Satellite navigation alone is not enough because the signals are susceptible to interference.

ASC is specialised in measurement technology and manufactures a wide range of highly sensitive accelerometers and gyroscopes, as well as Inertial Measurement Units (IMU) for rail transport testing and monitoring. The sensors collect data in a wide variety of applications – not only in rolling stock, but also on tracks.

Fatigue Strength Testing under Extreme Conditions

Capacitive accelerometers from ASC do many things, including making trains safer. Rolling stock manufacturer Alstom uses them to measure the running dynamics (as per EN 14363) and the bogie strength (as per EN 13749) under real-life conditions. The ASC sensors used for this purpose not only have a high signal amplitude of $\pm 2.7V$ for measurement ranges from $\pm 2-200g$, but also a wide DC

frequency range of up to 7kHz. They also have high long-term stability, enabling accurate measurement of even low linear accelerations and low-frequency, dynamic and static constant accelerations. The sensors are extremely robust to weather conditions, withstand shocks of an intensity of up to 6,000g and operate in a temperature range between $-40^{\circ}C$ ($-40^{\circ}F$) and $+125^{\circ}C$ ($257^{\circ}F$). These are important prerequisites for use on test tracks, as the measurement technology is exposed to all kinds of weather on them.

Bridging Navigation for Interrupted GNSS Signals

Sensors also play an important role in the exact positioning of trains, since knowing exactly where they are is vital for rail safety. Satellite navigation alone is not enough, as GNSS signals are lost in tunnels,

Ride comfort measurement according to EN 12299

- Assessing the impact of train movements on passenger comfort



forest areas or covered railway stations, with no or only very weak reception. Inertial Measurement Units from ASC take over position determination in these areas, thus bridging the time taken for the satellite signal to be fully available again. IMUs are ideal for this field of application because they capture even the slightest rotatory and linear movements and take up very little space.

Case Study: The SAMIRA Research Project

ASC Inertial Measurement Units are used to determine, for example, the position of freight cars in Aachen University of Applied Sciences' SAMIRA research project. This project involves the development of a smart rear-view camera to make freight trains' switching process significantly more efficient. The camera, together with sensors, monitors the car's travel, and thus requires less personnel. This

will help to overcome the skills shortage which also prevails in rail transport and improve the overall competitiveness of rail freight. The ASC IMU is used as a backup for position determination on freight cars. It captures the exact position of the cars, even if the satellite navigation signal is temporarily interrupted. This guarantees the continuous high-precision localisation of the cars so that switching operations can be carried out much faster in the future.

Track Damage Detected Early

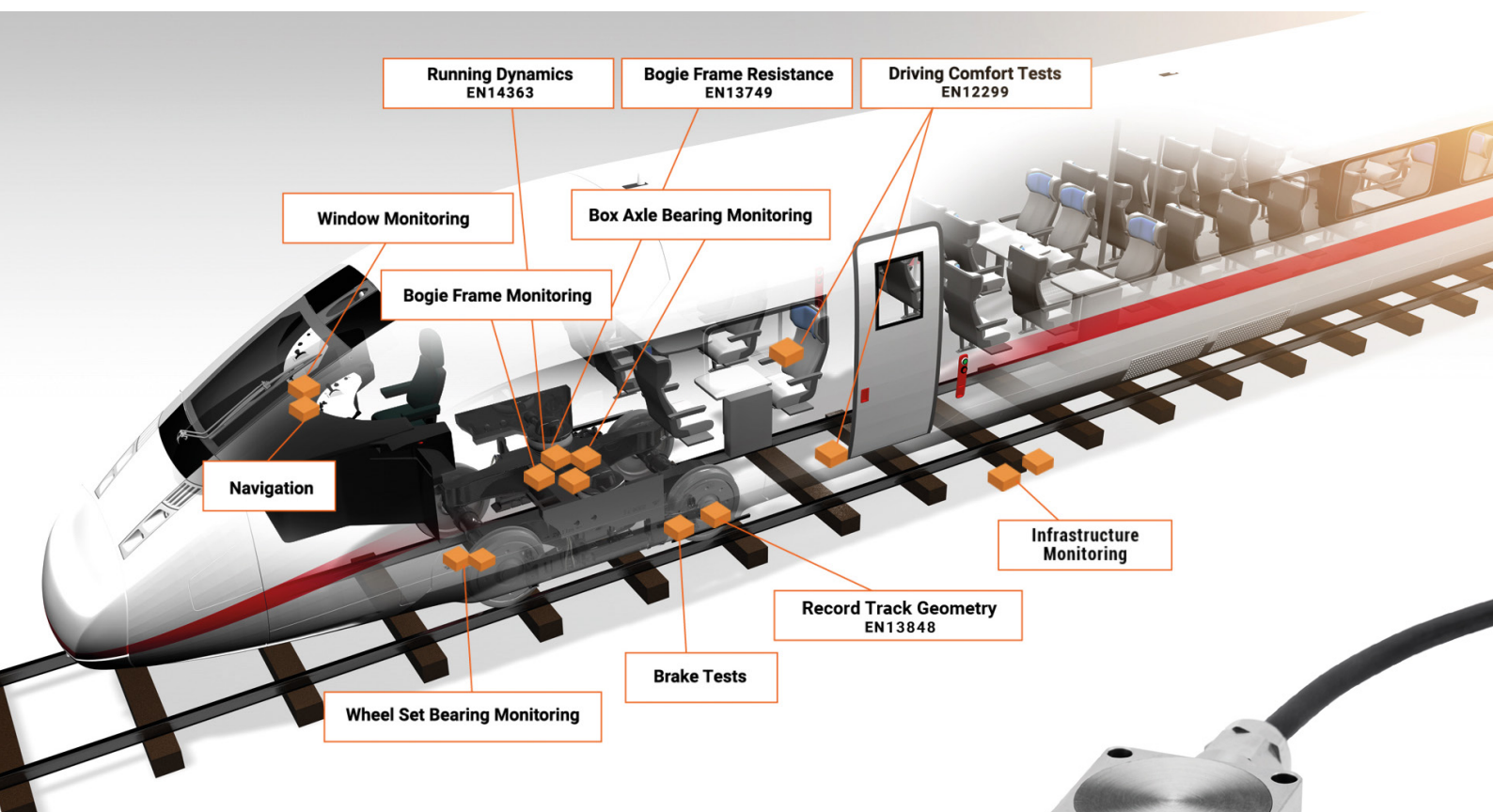
Capacitive and piezoelectric accelerometers are also essential for continuous track monitoring (CTM). Deutsche Bahn AG has been using ASC sensors for track data acquisition on its long-distance trains for several years, with the sensors in normal operation measuring the vertical acceleration in the wheelset bearings and the

acceleration inside the car bodies (as per EN 13848).

DB Systemtechnik GmbH – Deutsche Bahn's engineering office – can use the data obtained to identify irregularities in the longitudinal level of the track structure. Variations in longitudinal level have a major impact on performance levels. If there are errors in the geometry, maintenance measures must be taken immediately. In extreme cases, whole sections of track may even have to be closed. CTM using sensors allows potential damage to be detected and remedied at an early stage. This has absolutely no adverse effect on vehicle operation.

Functional Modules System for Maximum Flexibility

With the volume of rail passengers constantly growing, this leads in



turn to an increasing burden on the network and the trains. Digital technologies are used more and more in the railway sector to meet these high demands. They require ever more compact and intelligent sensor solutions. With its smart sensors and functional module system, ASC can meet these challenges. The functional module system comprises, firstly, the hardware used, consisting of reliable and proven sensor elements for determining the physical values of acceleration and/or angular velocity, the housing suited to the harsh environment conditions and the wired or wireless data transmission with a variety of standardised interfaces. Secondly, it includes the flexible combinable software components for signal processing, which is done locally on the sensor itself.

ASC's Smart Sensors have computing power that can be freely used to customise the characteristic extraction algorithms to suit your needs. Pre-processing performs data reduction in the first stage of the process. On this

basis, for example, fast Fourier transforms (FFTs), wavelets or time series characteristic vectors can be extracted. The subsequent trend analysis and/or clustering of the results thus generates targeted status information about the components or the system. Users are always responsible for their own data sovereignty and application programming interfaces (APIs) are used to integrate customer-specific algorithms.

Smart inertial sensors from ASC can be integrated as an open system into any other system. They can be used for any acceleration, vibration or angular velocity measurement application and are designed according to the customer's requirements.

Intelligent Sensors Transmit Data in Real Time

Previously, data used to be recorded externally and evaluated at intervals. With the new smart

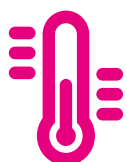


sensors from ASC, processing is done directly on the sensor, which then issues a status message using the traffic light principle. Rail network operators can now monitor the condition of rolling stock and infrastructure in real time and detect irregularities even more quickly. This keeps the number of service interruptions down to a minimum, as interruption-free operation is the basic prerequisite for more intensive utilisation of railway lines. Deutsche Bahn's overarching 'Strong Rail' strategy is aimed at helping achieve the German government's transport and climate policy objectives. ASC sensors can therefore indirectly contribute to the shift of traffic from road to rail.

www.asc-sensors.de



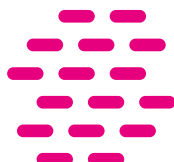
Czech Producer of Sensors, Switches and Converters for Railway Vehicles



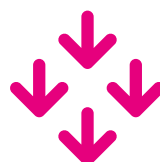
temperature



humidity



CO₂



atm. pressure



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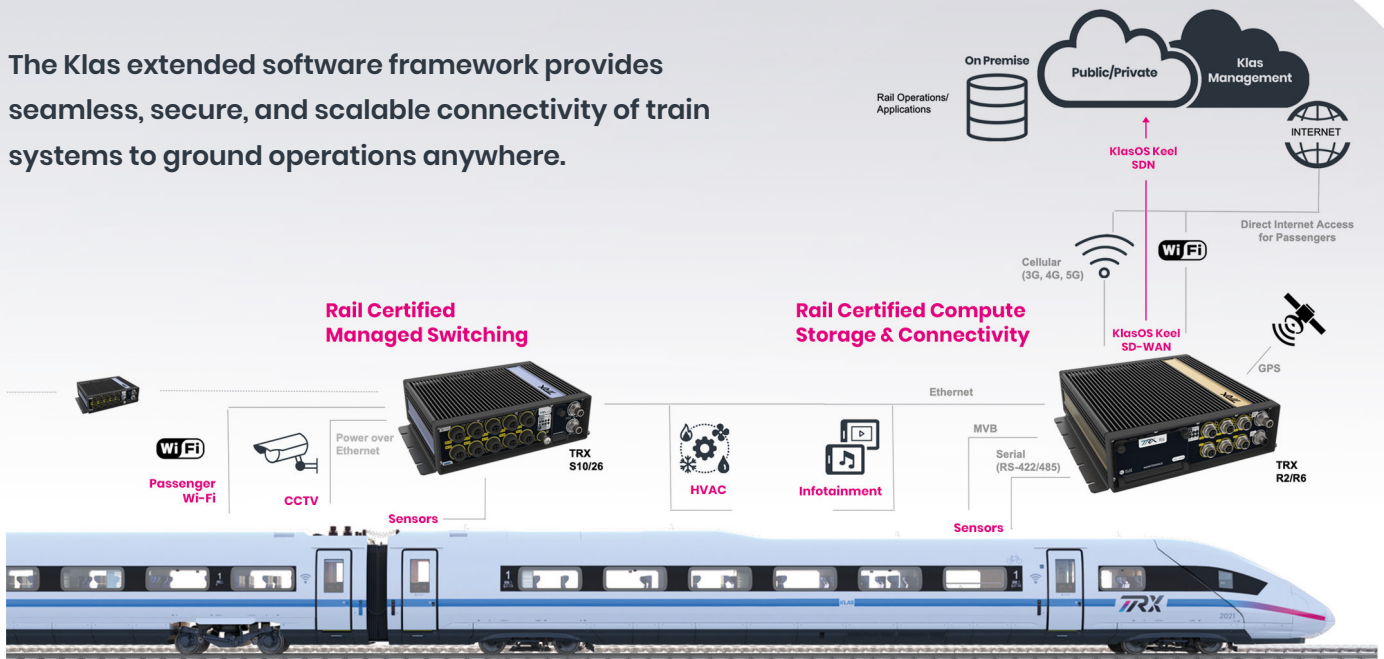


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KLAS

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Extending the Value of Rail CCTV

Over the last decade, safety in the rail industry has dramatically improved with the use of CCTV. Train Operating Companies (TOCs) realise the many benefits digital media offers, from monitoring passenger safety to assisting in rail operations.

The advances in 3G/4G/5G cellular networks and the rise of the Internet of Things alongside the proliferation of cloud services have enabled TOCs to extend CCTV operations from a station/platform-only use case to an operations-wide requirement that encapsulates the passenger experience.

However, in older rolling stock operational blind spots continue to exist. With the return-on-investment many years away from maturing, many TOCs are now looking at retrofit plans to ensure a seamless passenger experience across the complete service network.

For TOCs, this is an opportune time to revisit and rethink their CCTV deployment's overall architecture. With the technical advancements in software-defined networking, there are potentially significant savings to be made in terms of running and operational costs.

Lowering the Total Cost of Ownership

The investment in passenger safety comes at a high cost to TOCs. But do TOCs need to underwrite the entire cost of a CCTV retrofit?

The short answer is no! There are three essential parts to a CCTV deployment plan: the cameras, a network, and the NOC. Very little can be done with the cameras and NOC, but the network offers the most significant potential to lower the total cost of ownership for CCTV retrofits.

The ability to segment the network into distinct service layers isolated from the CCTV allows TOCs to onboard additional partner services. With each new partner onboarding, there is the potential to gain additional revenue, thereby helping to revitalise the revenue generation potential of old rolling stock.

Maximising Return on Investment

To maximise the return on investment when deploying a network for CCTV, TOCs need to be able to first isolate the CCTV service from all other services for security purposes. Traditional network architectures would dictate the use of separate components of computing, network, and memory. Unfortunately, legacy architectures are contrary to an efficient and economic roll-out for a CCTV retrofit programme.

TOCs must now look at the advancements in edge compute gateways that offer virtualisation technologies. TOCs benefit from a single platform of computing, network, and memory that is shareable between the CCTV and any other additional services.

For example, using a single compact rail-compliant platform that hosts CCTV, passenger infotainment, and alerting services reduces the number of times the rolling-stock is out of commission to install and maintain service continuity. Other indirect benefits include space saving, reduced cabling, and less

power consumption per carriage.

A further advantage of adopting virtualisation is every compute and storage byte available on the gateway can be fully utilised. One such way is to add new services in the future or migrate existing physical onboard computers to the virtual platform, thereby reducing IT and maintenance costs across the entire rolling-stock.

CCTV Camera Evolution

Rail CCTV permits for many service use-cases, from internal carriage 360 views, to forward-facing and external cameras, even driver-controlled cameras. However, one consistent fact is that camera technology advancement is dependent on the onboard network type.

Network Video Recording (NVR) harnesses IP networking technology to communicate with cameras to transmit digital video. For TOCs undertaking a retrofit, the ability to access existing ethernet cable looms will significantly minimise the effort required to fit cameras. Irrespective of re-using or pulling new cable looms, there is the need to aggregate cameras through switching technology. When selecting a compute gateway to stream the video to the NOC, TOCs should also consider their switching requirements to

interconnect the cameras. A holistic gateway and switch solution greatly simplifies running and managing the network over the rolling stock's lifetime, with the additional advantages of reduced IT effort.

A further observation of camera selection is the requirement for additional metadata such as time and location to simplify evidence gathering for security incidents. The ability to easily integrate GPS data with captured video implies the compute gateway must generate or ingest GPS data feeds.

Minimising Retrofit Downtime

When it comes to installation time, it's clear that TOCs are making no money while rolling stock is sitting in the yard. CCTV installers need to be able to quickly and easily install the system. The first thing is to ensure that all components are ruggedised and compact to minimise manual handling efforts.

Another viewpoint is that the CCTV installers are not the people managing the system once live. The distinct roles create a potential gap in misconfiguration and this ultimately leads to failures. With software automation, TOCs can reduce the effort of configuring cameras and eliminate human errors.

Software automation can assist with a methodology for allocating CCTV camera network address schemes that provide the NOC with a strategy for seamless access to cameras. Furthermore, software automation simplifies the management of the IP network when extending between carriages or train formations. The challenge the TOCs now face is the ability to remotely access cameras securely from the NOC.

CCTV Cybersecurity

The threat to IP-networked, enabled cameras is real, and these devices have garnered significant lousy press over the years. Cybercriminals are actively pursuing IP-enabled cameras, which is evident from cyber threats that are designed specifically for IP cameras such as Mirai*.

The last thing TOCs need is bad press associated with a security breach concerning CCTV. Cyber breaches bring potential public lawsuits from privacy activists. Fundamentally, security has to be baked in at the beginning of any project. Security can be expensive, but simple countermeasures can help significantly reduce costs when retrofitting trains.

One example is to leverage the virtualisation capabilities of the compute gateway to isolate and





segment camera networks. There will be separate networks by design to manage the cameras, control the cameras, and send video data. An additional security best-practice is to adopt an in-depth defensive strategy by creating private networks over the internet. The implication is the ability to isolate and overlay secure networks over the top of any data bearer for the train to ground communications.

In the cellular world, the Mobile Network Operator (MNO) will happily sell a private Access Point Name (APN) that isolates traffic from the internet. Private APNs bring additional security expenditure and management costs. The issue for many TOCs is the need for multiple MNOs to ensure high availability of camera connectivity, adding to the overall complexity of deployment.

A more efficient way is that the compute gateways support multiple cellular modems that enable a Software-Defined Wide Area Network (SD-WAN). By adopting SD-WAN, the TOCs can automate

MNO-selection and deliver a private network overlay to ensure CCTV connectivity without the additional expense of MNO private APNs.

Lifecycle Management

Once the CCTV service goes live, TOCs need the flexibility to monitor the cameras and onboard system performance. In the event of a fault occurring, the NOC will need access to the train irrespective of location.

However, this raises two challenges for the TOCs; the first is that the camera is not accessible due to the MNO network's constraints. The second is that the NOC operators are not sitting waiting for faults to occur and so days go by before errors are identified.

By selecting a compute gateway that supports a software framework for connectivity, TOCs can create a secure virtual private network with ease without additional infrastructure expenditure or throwing money at MNOs. Through simple network protocols with

alerting in the NOC, TOCs can drive predictive maintenance and reduce in-life management costs, with minimal complexity.

Delivering Peace of Mind

In summary, CCTV not only provides peace of mind to passengers but opens the doors for TOCs to create new revenue streams when retrofitting rolling stock. By choosing the right CCTV and network infrastructure partners, TOCs can deliver services that will change the passenger experience of their services forever.

With the flexibility to consolidate and concentrate existing systems into a single computing platform, TOCs can reduce IT expenditure and ultimately lower the total cost of ownership for their CCTV programme.

To learn more about Klas and how our products can help deliver cyber-secure rail CCTV services, visit www.klasgroup.com.

*[https://en.wikipedia.org/wiki/Mirai_\(malware\)](https://en.wikipedia.org/wiki/Mirai_(malware))



Frequentis AG

Optimising Railway Performance

How can railway operators streamline operations to benefit passengers and increase cost effectiveness?

Richard Ellis-Edwards, Frequentis Public Transport New Business Development Manager, explains...

Disruptions to normal rail service are inevitable for all heavy and light rail operators, no matter how efficient their overall performance. Signalling issues, power failures, or even the seasonal challenges of leaf fall or temperature-related speed restrictions may cause significant delays, service alterations and cancellations. There are also potential emergency situations where the safety of passengers as well as rolling stock and infrastructure must take precedence over business as usual operations.

Yet, when these events occur, an incident management solution

can really make the difference. It puts operators in a position to communicate critical information to the relevant stakeholders, both internal and external, and trigger the right processes, therefore ensuring that the necessary steps are taken to recover service to normal operations levels as quickly as possible.

Frequentis has assisted multiple operators worldwide to realise the benefits of efficient and effective incident and crisis management with its control centre solutions.

“In general, the main issues in the management of incidents are insufficient resources and inadequate compliance with the operator’s internal guidelines,” says Ellis-Edwards. “Also, a lack of clear operational models and agreed principles between all the parties involved, i.e. critical infrastructure providers, public authorities, the police, ambulance and fire-fighting services, internal departments at railway companies and specialist institutes.”

To meet this challenge, operators need to correlate data from a

growing number of operational systems and make sense of it at sufficient speed to respond effectively – either to handle incidents when underway, or to prevent, predict or flag them up.

Frequentis believes that solutions in the field of incident management should be based around decision-making, communication and workflows.

The Frequentis incident crisis management (ICM) solution guides the user through the necessary steps to be performed in an incident, depending on the occurrence and stakeholders required to resolve it. The ICM solution tool enables different groups to work on the same incident together, adding and editing information simultaneously. Furthermore, the ICM mobile application gives staff at stations and on trains real-time information about what’s happening. All these features and functions speed up the workflow and reduce potential errors. The ICM also documents all steps undertaken during incident resolution for post-incident and safety analysis.

The Frequentis ICM solution benefits Austrian Federal Railways (ÖBB) through the workflow and incident management IT tools, which are employed during operational incidents and during times of service disruption, that can occur at any point across its extensive network.

“As part of ÖBB’s commitment to delivering a reliable and punctual rail service for its many customers across Europe, we continually search for new technologies that can provide improvements and efficiencies and can be readily integrated into our operational practices. One such example of this is Frequentis ICM solution, which logs all pertinent information associated with any incidents, including media recordings and imagery, and effortlessly interfaces with third-party solutions making the role of the operator less paperwork-intensive,” says a representative of ÖBB *“This means less impact on journeys and a more reliable and punctual train service across our railway networks.”*

Providing clear, informed, timely and precise information and communications to internal and external stakeholders ensures accurate logging and distribution of all relevant information, allowing teams and partners to make critical decisions and take the necessary actions faster than before.

Geoff Howard, Sydney Trains Railway Operations Centre Program Director also observed the benefits of the Frequentis ICM, stating: *“Operators have praised the ease of use of the [Frequentis] ICM solution for logging and viewing incidents, and the coordination of all communication, providing*

up-to-date information to our customers. Being able to respond to and recover from incidents faster will ensure that we can cater for the projected capacity increases and meet the customer demand of the future.”

The OCM is designed to act as the starting point for an efficient and paperless workflow for operational communication and for incident management by allowing its operator to enter new incidents automated or semi-automated when they occur. All the incidents present in an operators’ designated area can also be seen through their console. When an incident is entered into the OCM, the incident manager will be notified immediately at the ICM, and all the relevant information will be presented to them.

“With the advancements in digital technologies, railway clients are looking to establish state-of-the-art rail operations centres and centralise operations by aligning functional roles, systems and processes,” explains Ellis-Edwards. *“Our Incident and Crisis Management solution supports faster communication of accurate, consistent and timely information to all relevant parties, including updates on service disruptions and service restoration. Our intention with this technology software solution is to drive automation to the next level, remove duplication and provide information as soon as possible in this workflow, always in electronic form and always with automatic handover between the systems.”*

“Beyond implementing optimised business processes for incident management, the solution supports access to notification sources such

as third-party web applications and media platforms, as well as an incident-reporting application for mobile devices. Without paperwork, duplication is eliminated, and processes become significantly more efficient.”

FREQUENTIS

Frequentis AG is an international supplier of communication and information systems for control centres with safety-critical tasks.

In the field of public transport, Frequentis’ solutions leverage over 70 years of experience in safety-critical communications and applications. Cross-industry expertise gained from supporting control centre communication lays the foundations for industry-leading rail and urban transport solutions.

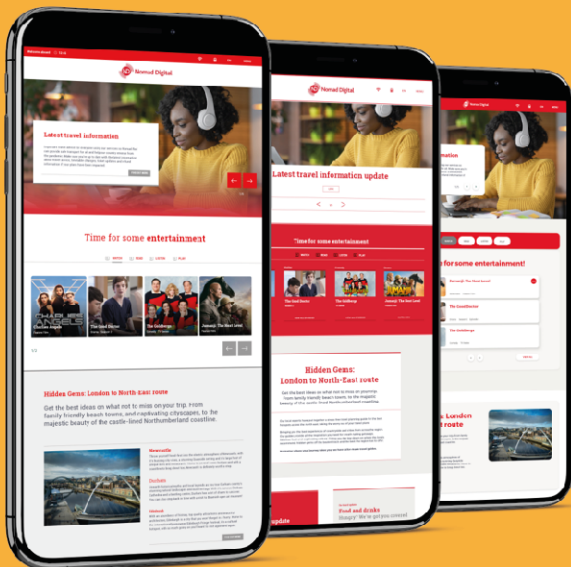
In addition to incident and crisis management the company also holds the number one market share in GSM-R dispatcher terminal positions: more than 8,000 units are currently deployed in customer control centres in over 25 countries.

www.frequentis.com

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TWO options for
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Nomad Digital

smarter transport, connected passengers

Nomad Digital

Passenger Experience Is Made Better with Nomad's Engage Portal

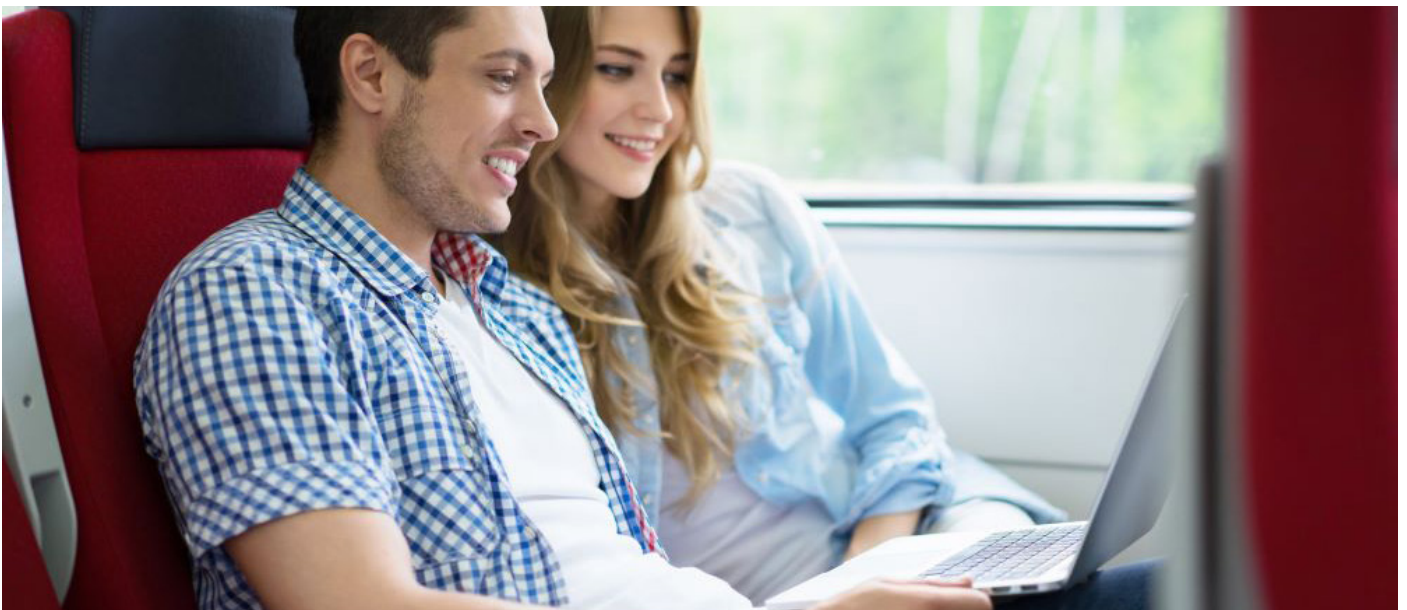
First impressions always count! Often, the first point of contact that passengers have with a transport operator's onboard services is when they log into the wifi service. Therefore, the train operator must provide an attractive landing page, which should match the branding of the service and vehicle operating company. It will act as the hub for the train operator's Nomad **Engage Portal**.

The primary reason a passenger connects to the wifi service is usually to use the public internet. Doing so in an environment which has limited connectivity can be costly for the vehicle operator to run. Providing services which can inform and entertain the passenger without having to generate too much internet traffic is a cost-saving for the provider and benefits passengers as they don't have to

rely on connectivity. Services within the Engage Portal can work offline (although connectivity is needed periodically to update content) which results in a more seamless experience for passengers.

Part of the Intelligent Journey

Key attributing factors of using



Nomad's Engage Portal are its ability to offer information and entertainment to the passenger, especially when not all vehicles have the hardware capabilities to provide passenger information within the carriage. For example, carriages may not have display screens and even where screens are deployed, they cannot provide personalised or in-depth information.

The Engage Portal helps to address this problem, acting as part of the Intelligent Journey and improving passenger experience by providing information such as:

- Moving maps
- Train schedule information
- Information regarding destinations
- Connecting bus routes
- Taxi information
- On-board locations of the buffet cart, toilets etc.
- Ordering food via an online menu

Building in third-party information and services is also a great opportunity for adding value. Partnering with local businesses (near destination stations) can create greater exposure for both parties. For example, they may provide passengers with the information of a local taxi service when the train is within a set radius of the station.

Accessibility

An additional benefit of using the Engage Portal is the opportunity to provide extra assistance to passengers who have special requirements. For example, it can be used to present accessible services for people with hearing or visual impairments.

A passenger who is visually impaired would benefit from an audio guide and a passenger with audio impairments would be better able to read announcements via a web page. Furthermore, the train operator can use different languages within their Engage

Portal, as an audio announcement service may only use one or a few languages. This allows passengers with hearing impairments or passengers who do not speak the local language to follow the announcement.

Equally important, the Portal allows the train operator to provide their passengers with tailored information regarding the destination of their station. For instance, they can provide wheelchair accessibility points and communicate to the station if a wheelchair ramp will be required.

Entertainment

A train or bus journey can be a great opportunity to do some reading, catch up on a TV show, or even watch a movie. Static media (newspapers, magazines, audiobooks) can be updated periodically by the vehicle operator and provided to their passengers in an offline format. This benefits the passenger by providing a

better viewing experience and improving internet connectivity as the available bandwidth is not used up by streaming media. This also has financial benefits for the train operator in reduced data charges. For example, daily newspapers can be electronically updated in the morning and fed in an offline format to passengers throughout the day.

Rail entertainment can improve the passenger experience by providing an extensive library of premium media content, including:

- Movies
- TV series
- Documentaries
- Music

Premium media content is encrypted via a Digital Rights Management (DRM) system to

ensure that it cannot be copied. Displaying this type of media requires trusted systems with appropriate keys to unlock the media. The Nomad Digital Engage Portal comes equipped with a DRM application which is accepted by a wide range of global media providers. This provides the technology to unlock media on the vehicle, allowing the transport operator to stream offline hand-

selected movies to their passengers. Transport operators can further enrich their passengers' experience by integrating their video-based media with their moving map. This would for example allow them to play informative videos when they pass certain landmarks or destinations.

By **Sam Taylor** with special thanks to **Paul Vaclik**.

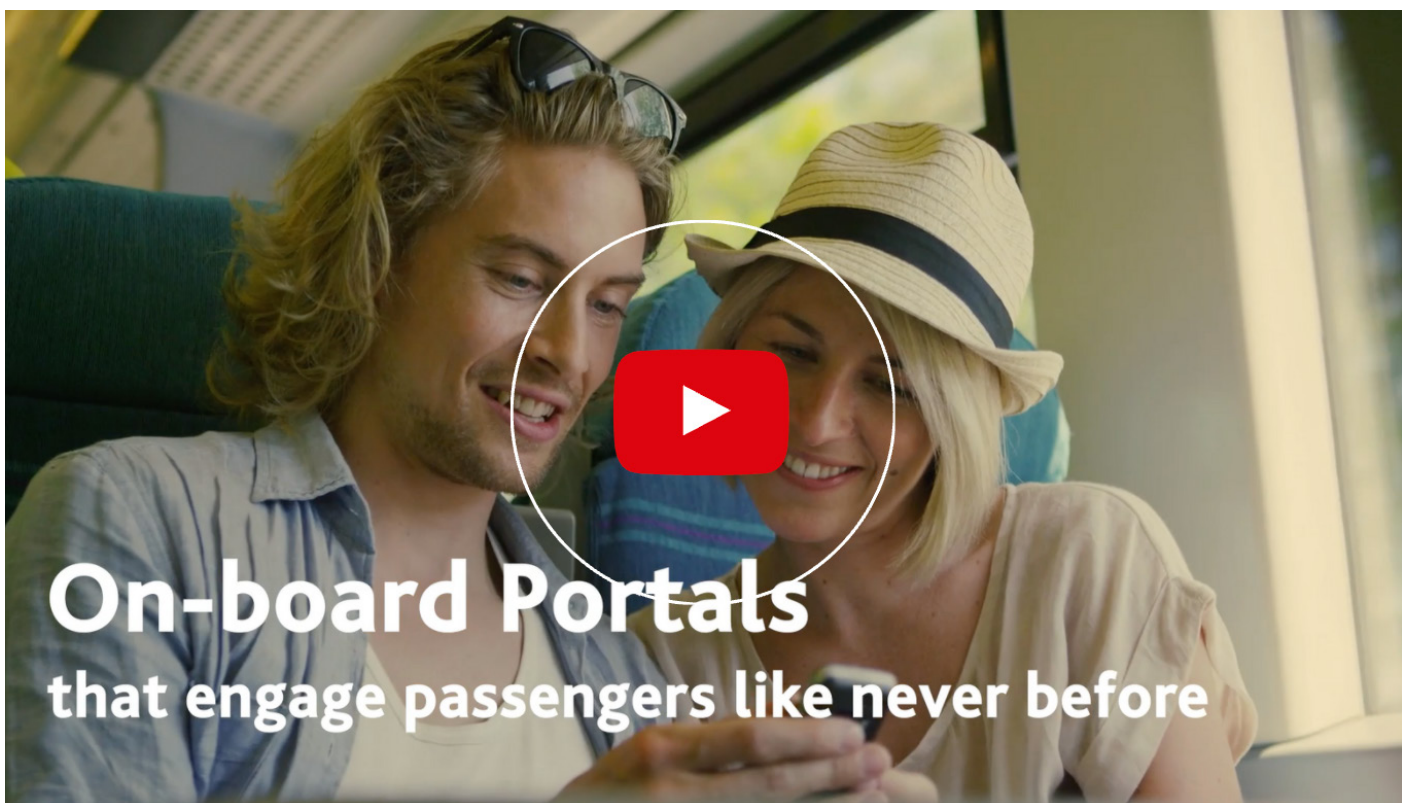
Why is the longer train journey
becoming a trend?
Read more here



Tell me more about the
Engage Portal



Nomad Digital's Engage Portal



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Limitless textile possibilities

From plush moquette textiles to sleek flat woven fabrics and pure leather ranges, Camira's construction capabilities are without limit – and, with an in-house design studio and a world-leading reputation in flammability performance, we are experts in making design dreams a woven reality.

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Railway Fabrics: Everything You Need to Know

With almost limitless potential, the creation of the ideal fabric for your rail interior can be a daunting, if exciting, task. From choosing the perfect shade and establishing an on-brand pattern to navigating global flammability standards, there is a myriad of considerations to take into account – and it can be difficult to know exactly where to start.

In this article, Aimee Larson, Senior Designer at Camira – the UK's leading manufacturer of transport textiles – explains everything you need to know about creating the perfect fabric for your railway.

First things first, construction:

To begin, I always recommend identifying the aesthetic you'd like to achieve, and the priority of your key concerns – are you looking for a traditional or contemporary interior? A sleek or textured finish? Is practicality at the top of your list? Once you've established the answers to these questions, you'll be in a much better position to begin identifying which construction is the best fit for your needs.

In short, there are four types of construction from which to choose your railway's upholstery, and these can be summarised as follows:

- **Plush:** In plush fabrics, the yarn threads stand upright from the ground structure of the fabric, with the individual ends cut at an even height to create a completely levelled surface finish. Highly effective at dispelling dust, plush fabrics offer the ultimate in practicality, and are a timeless, ultra-comfortable, upholstery choice
- **Wire woven:** Taking their name from the metal wires which are inserted during the weaving process between the raised pile threads and the fabric ground to form loops of pile above the foundation, wire-woven fabrics are perfect for interiors which want a sleek look, without compromising on durability. Also available in Hybrid, an innovative wire-woven fabric construction unique to Camira, the double density all loop face is designed to withstand the demands of today's transport world, making it a robust yet stylish option.
- **Flat woven:** Characterised by their flat, two-dimensional surface, flat-woven textiles are created by interlacing warp and weft yarns which construct a fabric where the yarns lie flat rather than upright. A contemporary choice, flat woven fabrics provide a sleek aesthetic, in keeping with the automotive trend.
- **Leather:** An alternative upholstery option, pure leather, such as our Elite range, provides the ultimate in luxury and can

be used alone or in combination with woven fabrics to create accent areas on side panels, bolsters, headrests or piping.

Now, let's talk colour:

Many railways opt for their upholstery to be designed in their brand colourways – whether as a piped accent to a base neutral, integrated into a woven pattern, or embroidered as a logo – there are a number of different approaches. At Camira, we specialise in custom-made fabrics, working in close collaboration with specialist design houses to turn their design concepts into woven realities; from developing exact colour matches to creating perfect pattern repeats, our in-house design studio has the expertise to translate ideas into reality.

In terms of general colour advice, we always recommend avoiding pale shades, such as pastels or taupes, on seating upholstery –

simply due to their susceptibility to staining and scuffing – and instead using them as delicate accents on trims, e.g. curtain tiebacks or piping. There's a reason that so many railway interiors opt for darker shades or vibrant tones – they really do hide a multitude of sins, and with intelligent, considered pattern designs, there is no limit to the visual detail they can offer.

Iconic Designs

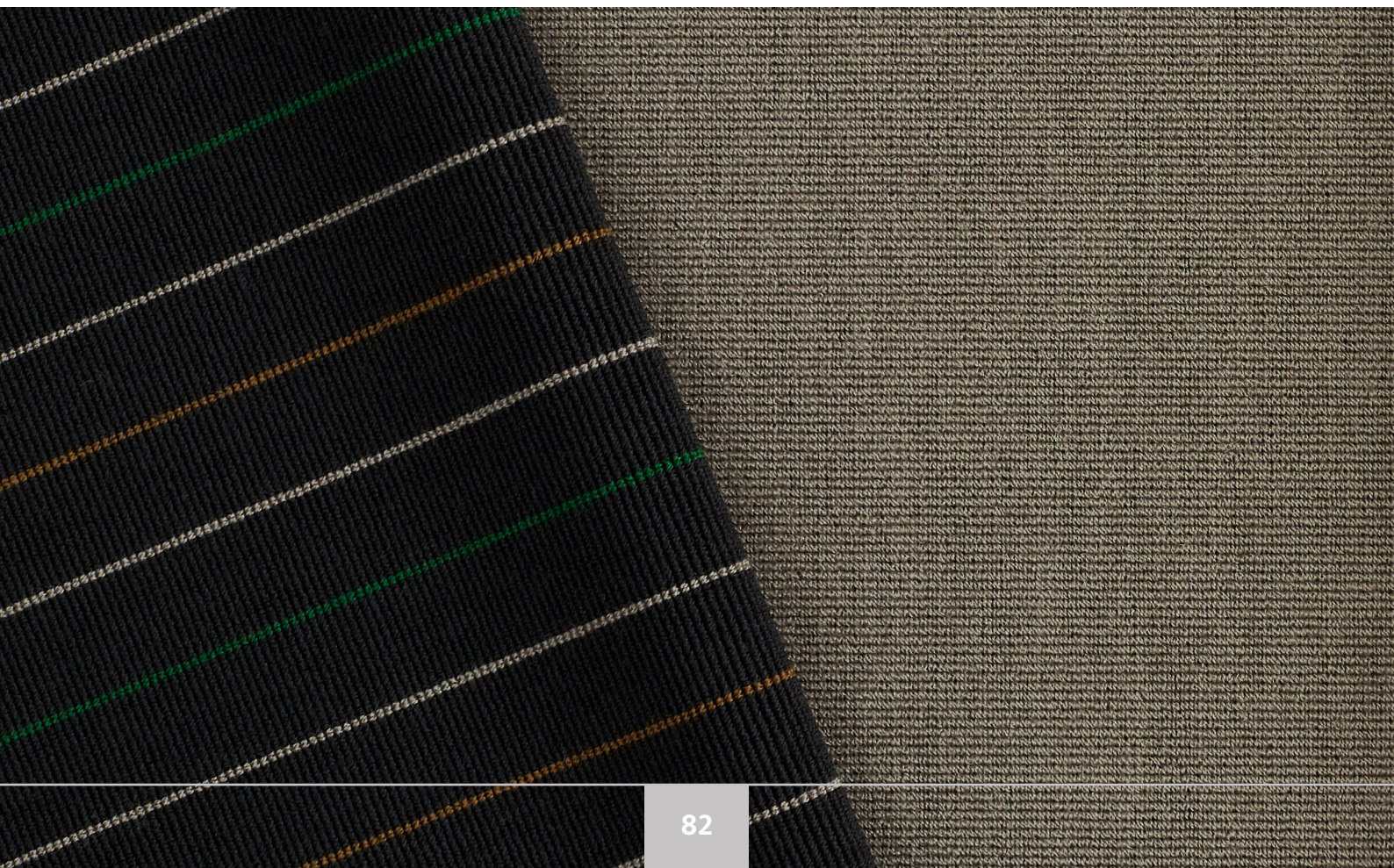
Associated with many high-profile contracts where the fabric has become instantly recognisable as an iconic part of the branded interior – think London Underground, the Orient Express, Thameslink, First Great Western, Belgian Rail, Swiss Rail and Queensland Rail to name but a few – our design team has a proven record of developing textiles for rail interiors that are not only on brand, but visually striking – and manufactured to withstand the most demanding of performance requirements.

Bespoke Concepts vs Standard Ranges

The vast majority of railways opt for a bespoke textile, however for those requiring an expedited turnaround, or those who would like a pre-designed quality, there are a number of ways in which this can be accommodated. For example, at Camira, we offer an extensive range of standard patterns which are available to be custom-coloured to perfectly match a branded interior – providing a bespoke look within a reduced timeframe – or which can be ordered 'off-the-shelf', manufactured, treated to specific FR standards, and delivered with exceptional ease and speed.

Understanding Flammability Regulations

Formulated in 1987 on behalf of British Rail, the BR252 flammability



standard formalised the testing of rail carriage interior fabrics in terms of physical performance as well as their flammability properties. There are now a number of international fire tests and, to provide complete peace of mind, all Camira rail fabrics can be treated to the following geographic standards:

Britain

- **BS 6853: 1999:** The code of practice for fire precautions in the design and construction of passenger-carrying trains based on the fabric's location in the train.

Europe

- **NF F 16-101:** A French standard, this test analyses fire behaviour of material regarding its reaction to fire, opacity of smoke and toxicity of gases emitted.
- **DIN 5510: Part 2:** A German

standard, this test defines the parameters of combustibility, smoke development, dripping and toxicity.

- **EN 45545-2 Railway Applications:** The European railway standard for fire safety, this test defines the requirements for components dependent on end use and hazard category applied to the vehicle. Key parameters that are measured include flame spread, ignitability, heat release, smoke opacity and toxicity.

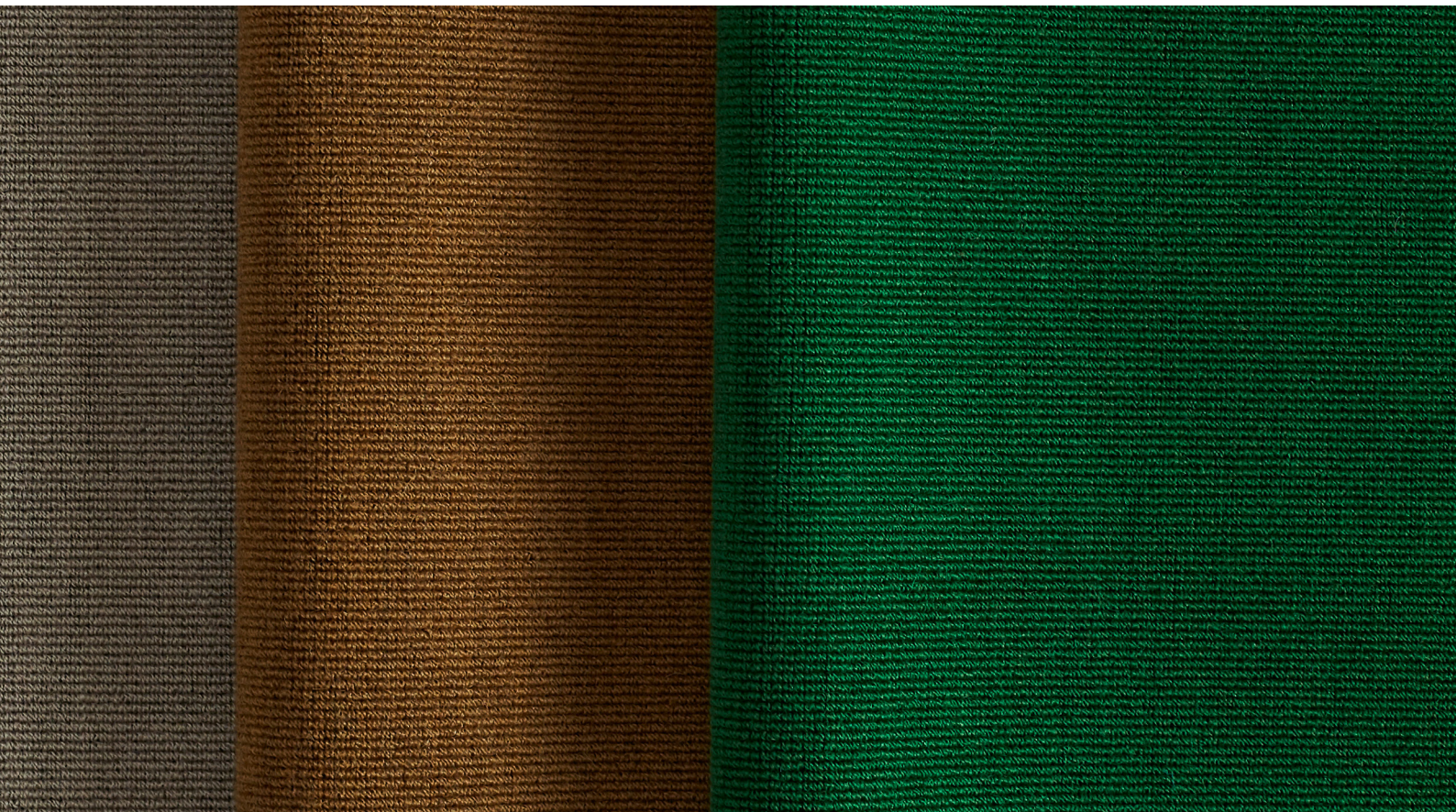
Rest of World

- **UIC 564-2: App 5:** A standard set by the International Union of Railways, this test method determines the fire-resistance of coated and uncoated textiles. The test measures the size of the damaged area and release of burning particles after a flame has been applied.
- **AS 1530:** An Australian

standard providing methods for determining the performance of external construction elements when exposed to radiant heat, burning embers and burning debris.

- **GOST 12.1.044.89:** A standard applicable to Russia, Belarus and Kazakhstan, this occupational safety standards system measures flame spread, smoke density and toxicity. An environmental test is also included.
- **NFPA 130 Standard for Fixed Guideway Transit and Passenger Railway Systems:** This standard is predominately used in North America and involves the use of FAR 25.853 (vertical flame test) and ASTM E 662 (smoke opacity test).

If you'd like to speak with our team of experts to learn more about creating the ideal textile for your rail interior, get in touch at transport@camirafabrics.com



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On the Right Track with ZARGES's Rail Offering

Worth more than 88bn GBP, the British rail sector is one of the most important contributors to the national economy.

Rolling stock is the lifeblood of the UK rail sector and the most important investment an operator makes, so it pays to ensure it is in top condition. That's why ZARGES, one of Europe's leading platform and access equipment specialists, offers a comprehensive range of maintenance solutions specifically designed for the rail transport sector, built on more than 50 years of experience working in close partnership with rail operators across the continent.

At the forefront of the ZARGES offering is a range of mobile solutions designed to provide safe, flexible access to all parts of a train carriage. Key products include fixed-height access steps; front and side-working platforms, available in a range of heights and suitable for all track widths; and roof-working platforms, providing single or two-sided access for ultimate safety when working on carriage roofs.

ZARGES also offers a number of stationary access solutions for the rail sector, including easy to set up roof-working stands, designed to reduce downtime while maximising safety, and universal platform system assembly stands. Made especially for the extension and final assembly of rail vehicles, ZARGES's assembly stands are available in both fixed and height-

adjustable variants. What's more, the front-working platforms have a load capacity of up to 400 kg/m², while the assembly stands have a capacity of 250 kg/m² – with the flexibility of the range meaning it can be adjusted to up to 500 kg/m² depending on the needs of the individual project. And as with all ZARGES products, increased safety is paramount, with fall protective railings installed on all sides of the platform.

Martina Moritz, Product Manager Special Solutions at ZARGES said: *"As the market leader in the manufacture and supply of access and work-at-height products, ZARGES products represent quality, durability and, most importantly, unbeatable safety."*

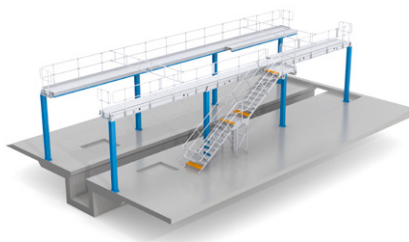
"We understand the unique



maintenance challenges faced by rail operators, which is why we offer an all encompassing service which goes beyond equipment into advice, planning, installation and full service for access solutions – all from a single source.”

To learn more about ZARGES’s rail offering, please visit: <https://www.zarges.com/uk/industry-sectors/rail-commercial-vehicles/> or <https://www.youtube.com/watch?v=2T4ZpReP4Hg>

For more information, please contact Jake Smith at HROC on jake.smith@hroc.co.uk / 07527 304176.





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FreiLacke has stood for innovative paints and coatings since 1926. The family-owned company has already entered its third generation and develops customised solutions for clients from the wheel and vehicle manufacturing industries, as well as those in the fields of mechanical and apparatus engineering, job coating, functional furniture, rail vehicles, wind power, storage technology, construction and sanitation, directly through its 600 employees at its Döggingen base in the Black Forest.

As a modern family-run company now in its third generation, the safeguarding of the head office is just as important as our worldwide sales and our international subsidiaries and partners.

The product range of Europe's leading system coating provider covers the entire spectrum from industrial coatings, powder coatings and electrodeposition coatings to composite solutions.

International sales are handled by a global network of subsidiaries and partners around the world.

Environmental protection has always been a key priority for **FreiLacke**.

Therefore, the company makes every effort to develop environmentally friendly products, reduce emissions, packaging materials and waste and use resources sparingly.

Applied **solutions.**

www.freilacke.com

Our solutions
at a glance (video).



Our solutions
at a glance (brochure).





ENGINEERING SOLUTIONS

OUR DEDICATED ENGINEERING TEAM has developed a particular expertise in the life extension, overhaul, maintenance and refurbishment of railway rolling stock and components. This is complimented by our ultra-modern facilities containing unrivalled resources and technologies, which gives us the capability to repair, refurbish and overhaul everything from wheelsets and HVAC to complete passenger and freight vehicles to the highest possible standards.



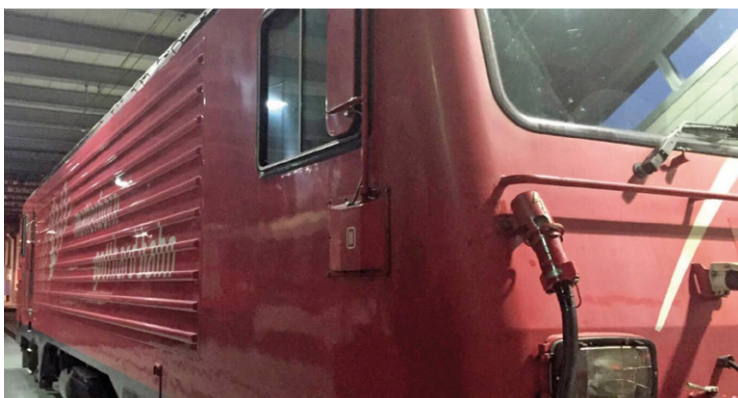
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Surface solutions for representative rolling stock

Anti Graffiti . Shiny lacquer
Glass restoration . Chewing gum removal

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 Directory

BIOforte

Your Surface Specialists for Representative Rolling Stock

- Cleanliness creates confidence
- Quickly remove graffiti
- Lacquer restoration: vital for preserving value
- Glass: restoration, not replacement
- Professional chewing gum removal and deep cleaning

Cleanliness Creates Confidence

People want to feel safe in busy public spaces such as on trains and around railway stations too. Rolling stock plastered with paint, grubby underpasses and grimy entrances and waiting rooms don't fill commuters and passengers with confidence.

Quickly Remove Graffiti

Trains are the preferred target of vandals and would-be artists who leave their tags behind as a parting gift. Railway companies and operators often get caught up in this game of cat and mouse. Get rid of graffiti straight away to help keep

copycats at bay! No matter the time or location, BIOforte's experts will be there in a flash – even while trains and stations are in use.

Moreover: "Good, prompt planning saves money, effort and frustration," says Anja Mannartz, Next Gen/ member of the board, before continuing: "Exposed surfaces and valuable rolling stock can be given lasting protection even when brand new, so that, even if they do become targets for graffiti, they can be cleaned fully, quickly and efficiently without delay using appropriate, VOC-free cleaning products – and not just by cleaning experts, but by your own staff too." This also avoids the need for costly service disruptions, logistical replanning and other expenditure.

With more than 20 years of international experience, BIOforte is a specialist in graffiti prevention and cleaning. "The situation with graffiti is similar all over the world, but the people responsible for dealing with it can't always do so to the same extent," says Udo Mannartz, CEO of BIOforte and long-serving expert on graffiti removal and surface cleaning. "This is where our expertise comes in. We can advise the people charged with removing graffiti, offer further training for their staff and deploy our own experts to deal with critical cases or particularly sensitive surfaces," he adds.

Not all graffiti enthusiasts have Banksy's artistic talents. The works of those who do can also be protected from being defaced.

Lacquer Restoration: Vital for Preserving Value

Sun, acid rain and cleaning products all attack lacquer on rail vehicles and metallic surfaces. Chalking can be added to that list, particularly if the rolling stock is being used around the clock. This can make materials susceptible to corrosion and wear, which can become very costly. Take lasting precautions with BIOforte, the proven lacquer restoration specialists!

Glass: Restoration, Not Replacement

BIOforte's glass renovation will leave you amazed and save you money. Using gentle and sustainable techniques, we remove scratches from any glass surface without having to replace the glass. We can subsequently apply a durable anti-scratch film to ensure that your glass offers you a long service life and a clear view.

Professional Chewing Gum Removal and Deep Cleaning

Chewing gum is a particularly persistent nuisance, whether it's stuck to the surfaces in busy areas or in carriages and the areas around them. BIOforte's EcoGum comes as a "ready to use" or professionally applied solution and offers an effective remedy. BIOforte specialises in bringing the shine back to the surfaces in any area, regardless of what's on them and what they're made of – from brick, concrete and bitumen to fibre cement, glass and asphalt.



BIOforte offers you the following advantages:

Specialist services in any location at a time that suits you. Rolling stock is soon ready for use again. Use of non-toxic, high-performing removal and protection products tried and tested in a wide variety of situations. Training, advice and sales of professional products and equipment. 20 years of experience across Europe working with Deutsche Bahn (DB), Swiss Federal Railways (SBB) and many more.

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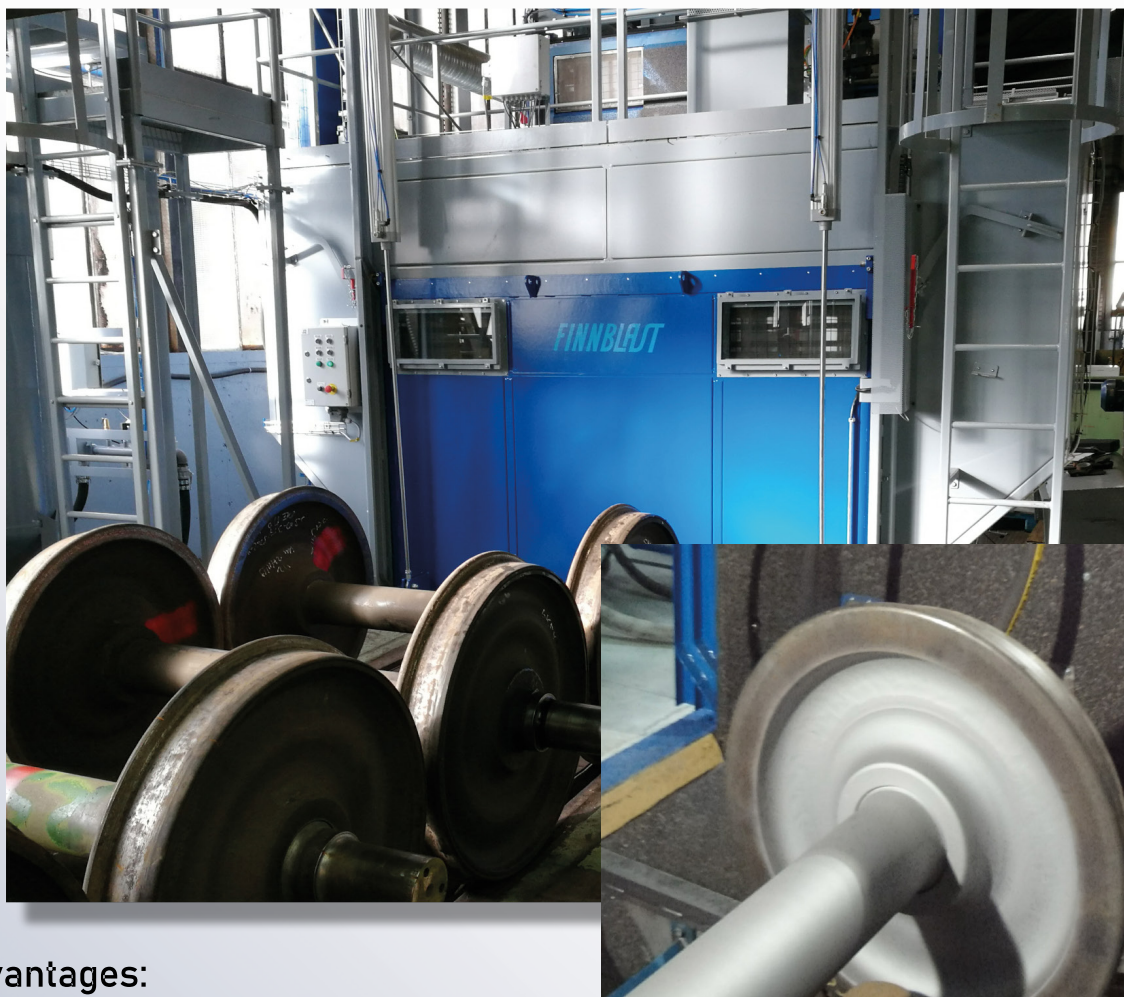
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