

# Railway-News

M A G A Z I N E

## In Depth...

The Government's Plans to Reform Britain's Railways ... p.12

&

## In the News...

A round up of the important rail news  
for Great Britain ... p.8



ISSUE TWO 2021

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# Letter from the Editor



Dear Readers,

After a long period of restrictions and gloomy news, there are finally some reasons to be positive and hopeful. The vaccination programme in Britain is working fabulously and at last the weeks of solidly miserable weather also seem to be over. Both of these factors are good news for Rail Live, which is one of the first shows to take place again since COVID-19 first reared its head; and of course it takes place largely outdoors, so some sunshine would be greatly welcomed for that too.

Rail Live is unique in that visitors get the opportunity to see plant and equipment live in action, with demonstrations taking place over the two-day event. Network Rail's leadership – Sir Peter Hendy and Andrew Haines – will speak at the event and no doubt the recently published Williams-Shapps Plan will be a hot discussion topic. Read our in-depth feature on the plan in this issue on p.12.

Another speaker at Rail Live will be

Ian Prosser, HM Chief Inspector of Railways at the Office of Rail and Road. His department has been working closely with Hitachi Rail on inspecting the Class 80x trains that were removed from service following the identification of cracks in their lifting points.

Beyond taking in the demonstrations and engaging with the fruitful industry discussions, this event will allow you to reunite with your rail industry peers. We will all have felt that services such as Zoom have been a godsend but nothing beats face-to-face encounters.

In this issue of the Railway-News magazine you will find our directory of railway suppliers, arranged in an easy-to-navigate, intuitive layout. The suppliers in this issue cover a broad range of topics that are key to the rail industry, from rolling stock maintenance, communications systems and ERTMS to questions about how best to provide passengers with the content they want to access. Read about their news and developments and enjoy the interactive features such as embedded videos to get the most out of your areas of interest.

We will be publishing our third issue of the year on 16 August. As always, if you want to be featured on our site or in our e-magazine, please get in touch with Andrew Lush at [al@railway-news.com](mailto:al@railway-news.com) or +44 7432 725001.

*Josephine Cordero Sapién,  
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# Issue Two 2021

## Features

### **p.6 RailLive 2021**

After last year's event was cancelled, this year's event is going ahead. It's time to reconnect to members of the UK rail industry again in person and watch live plant demonstrations.

### **p.8 In the News...**

A round up of the important rail news for Great Britain, including the ORR's investigation into the signalling market and cracks in the Hitachi Class 80x trains.

### **p.12 In Depth: The Government's Plans to Reform Britain's Railways**

On 20 May 2021 the UK government published 'Great British Railways – The Williams-Shapps Plan for Rail'. We take an in-depth look at what the plan says and what that will mean for the rail industry in Britain.

### **p.16 Directory**

A directory of railway suppliers for rolling stock, services, infrastructure, and data & information. Read about all the latest innovations and product developments in the rail sector.

### **p.86 Railtex / Infrarail**

With an international audience of visitors from more than 50 countries around the globe and hundreds of exhibitors from across the entire rail supply chain, the co-located event is an unmissable opportunity for stakeholders active in the rail market.

Issue Two 2021



**Where:** Quinton Rail Technology Centre, Warwickshire, UK

**When:** 16–17 June 2021



Operations team when performing aerial surveys. The team is hoping to bring a drone for live demonstrations.

## Speakers at RailLive 2021

- Andrew Haines, Chief Executive, Network Rail
- George Davies, Director of Sustainable Development, RSSB
- John Larkinson, CEO, Office of Rail and Road (ORR)
- Ian Prosser, HM Chief Inspector of Railways, ORR
- Sir Peter Hendy, Chairman, Network Rail

Following the huge success of the coronavirus vaccine roll-out in England, RailLive 2021 is one of the first rail events to go ahead again in real life. It is the largest outdoor rail exhibition in the UK, allowing attendees to see equipment in a real railway environment with many live plant demonstrations.

At the show, Network Rail will demonstrate its New Measurement Train (NMT), which monitors and records track condition information at speeds of up to 125mph. Network Rail has been using this converted

High Speed Train (HST) for almost 15 years. It is fitted with high-tech measurement systems, track scanners and a high-resolution camera.

Another Network Rail works vehicle at the show will be its stoneblower, which restores the line and level of the track by correcting its vertical and lateral profiles.

Lastly, Network Rail will be giving ground-based demonstrations of the high-tech cameras and equipment used by its Air

As usual, attendees are required to wear a high-vis jacket and sturdy footwear is also recommended. This year, extra precautions have been put in place due to COVID-19, which means that there will only be contactless payments and no cloakroom facilities. The walkway system will also be one-way where it is not possible to make them 5m+ wide.



“We’re incredibly pleased to be returning to Rail Live this June after a year away. It’s a great opportunity for the entire rail industry to come together to reflect on one of the most challenging years we’ve had and it’s a platform to discuss how we can reset and rebuild together.”

Network Rail CEO, Andrew Haines



## ORR Publishes Update Paper for Its Signalling Market Study

The Office of Rail and Road (ORR) launched its market study into the supply of signalling systems in Great Britain in November 2020. The ORR's interest in this part of the rail sector comes from the fact that signalling makes up more than 10 percent of Network Rail's total cost base and that it is a major area of growth, with 65 percent of external signalling assets projected to expire within the next 15 years. In its update paper, the ORR said it was concerned about the lack of competition in the British signalling market, with Alstom and Siemens alone taking a projected 90% of Network Rail's signalling spend (2019–2024). Furthermore, 97% of post-1990 installed base of interlockings has been installed by Siemens, Alstom or one of their predecessor companies. It was because of this that the ORR argued

against a Siemens/Alstom merger to the European Commission.

The ORR has consistently found that competition lowers prices for Network Rail, suggesting “that more competition and more viable players for both frameworks and individual tenders could help Network Rail drive better value”.

The ORR will publish its final report on 11 November 2021.

## Government Announces Sweeping Rail Reforms

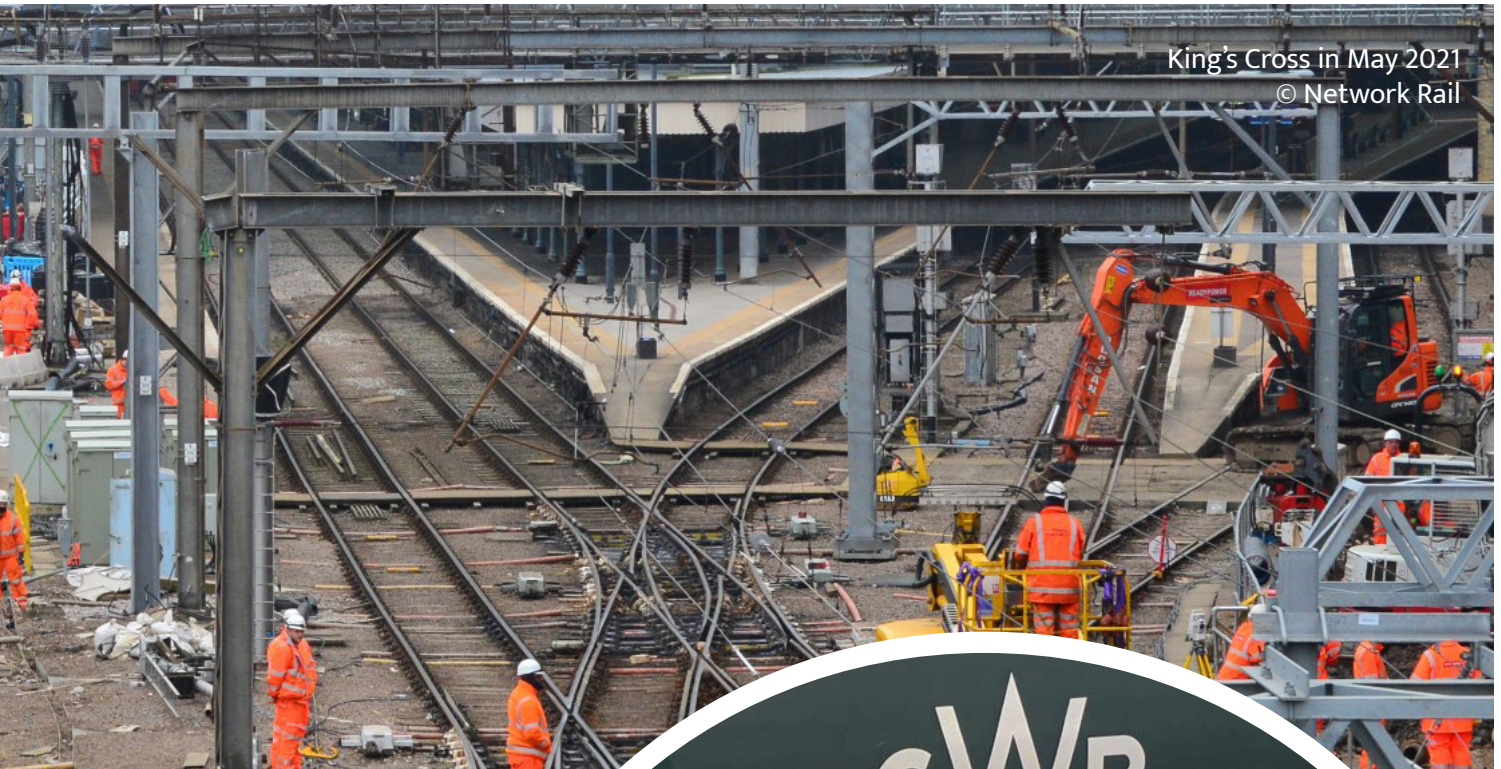
The UK government has announced reforms to the railways in Britain, starting with the establishment of a new public body called Great British Railways. The reforms also include an end to the franchise system, instead putting train operating companies on to Passenger Service Contracts – concession-based contracts where they would receive a fee for running services, while the government would take the money

and hold the risk from ticket sales – ticketing is also set to become much simpler as part of this overhaul.

## Hitachi Class 800s and 385s Found to Have Cracks

After cracks were found in some Hitachi Class 800 trains, all of the country's Class 800 trains as well as ScotRail's Hitachi-built Class 385s were taken out of service as a precaution. Hitachi Rail, train operators and the government then put a Service Recovery Plan in place to get the trains back into service following widespread disruption.

The cracks were found in the trains' lifting points, which are used to lift the trains when in a maintenance depot. **Ian Prosser, Chief Inspector of Railways at the ORR and speaker at Rail Live 2021**, said: “We've engaged with Hitachi and the train companies to oversee



King's Cross in May 2021  
© Network Rail

*their development of a safe and suitable plan. We're also continuing to provide the rigorous oversight needed to make sure the right checks are being carried out so that the trains are able to re-enter passenger service safely."*

## Uncrossing London Kings Cross

As part of the 1.2 billion GBP East Coast Upgrade, Network Rail is making a multi-million pound investment in renewing track, signalling and overhead line equipment over 1.5 miles at King's Cross. Much of the track and signalling equipment is more than 40 years old.

A major aspect of the works is the simplification of the track layout, which will make it easier for trains to come and go. Network Rail is also re-opening the third Gasworks Tunnel, which was closed in the 1970s. This will allow NR to add two

additional tracks on the approach to the station. The King's Cross signal box will be demolished, while the signalling system will be moved to the Railway Operations Centre in York.

In April, Network Rail achieved a major milestone on the project when platforms 0-6 were reopened and work commenced on platforms 7-11.





TM Northern 769 170521 Southport

The FLEX trains are now operating on the Southport – Stalybridge/ Alderley Edge route.

## TransPennine Route Upgrade (TRU)

The TransPennine Route Upgrade is a long-term infrastructure programme between Manchester and York. The route is 76 miles long and serves 23 stations. Network Rail is still working with the Department for Transport on the specific details of the upgrade. But early works are already taking place as well as works such as vegetation management, surveying and setting up compounds.

## Why Rail Electrification?

In April 2021 the Why Rail Electrification? report was published in collaboration with the Railway Industry Association (RIA), calling for a rolling programme of electrification in Britain. The report argues that for the transport sector to decarbonise, it must use electricity as it is “the only high-power energy source offering potentially net-zero carbon”. Network Rail said in its Traction Decarbonisation Network Strategy that in order to achieve net-zero rail traction, 86 percent of the as-yet unelectrified network should be electrified, with the remaining 14 percent going to alternative forms of traction.

In order to achieve net-zero by 2050, a start must be made now, given the scale of the works required. The report does not mince its words: “[...] railways cannot achieve net-zero carbon emissions without a large-scale electrification programme”. The report further lays out how electrifying the network will help drive modal shift, which it sees as “rail’s greatest contribution to UK decarbonisation”.

## Northern Introduces Bi-Mode FLEX Trains

Eight FLEX trains have begun operating on the Northern network in line with the new May 2021 timetable. The Class 769 bi-mode electro-diesel trains were converted by Porterbrook in collaboration with Wabtec and Brush, having started their lives as Class 319 EMUs on the Thameslink network in the late 1980s. By being adapted to bi-mode operation, these trains will be able to run on non-electrified track, while still using the OLE where existent.

Between Manchester and Stalybridge early works are taking place for the eventual electrification and re-signalling of the railway with train services affected this summer and into next year. Between Huddersfield and Westtown, Network Rail wants to double the number of tracks from two to four, electrify the line, and make major improvements to Huddersfield, Deighton, Mirfield and Ranthorpe stations.



TransPennine Route Upgrade near Manchester  
© Network Rail

Between York and Church Fenton Network Rail is electrifying the line.

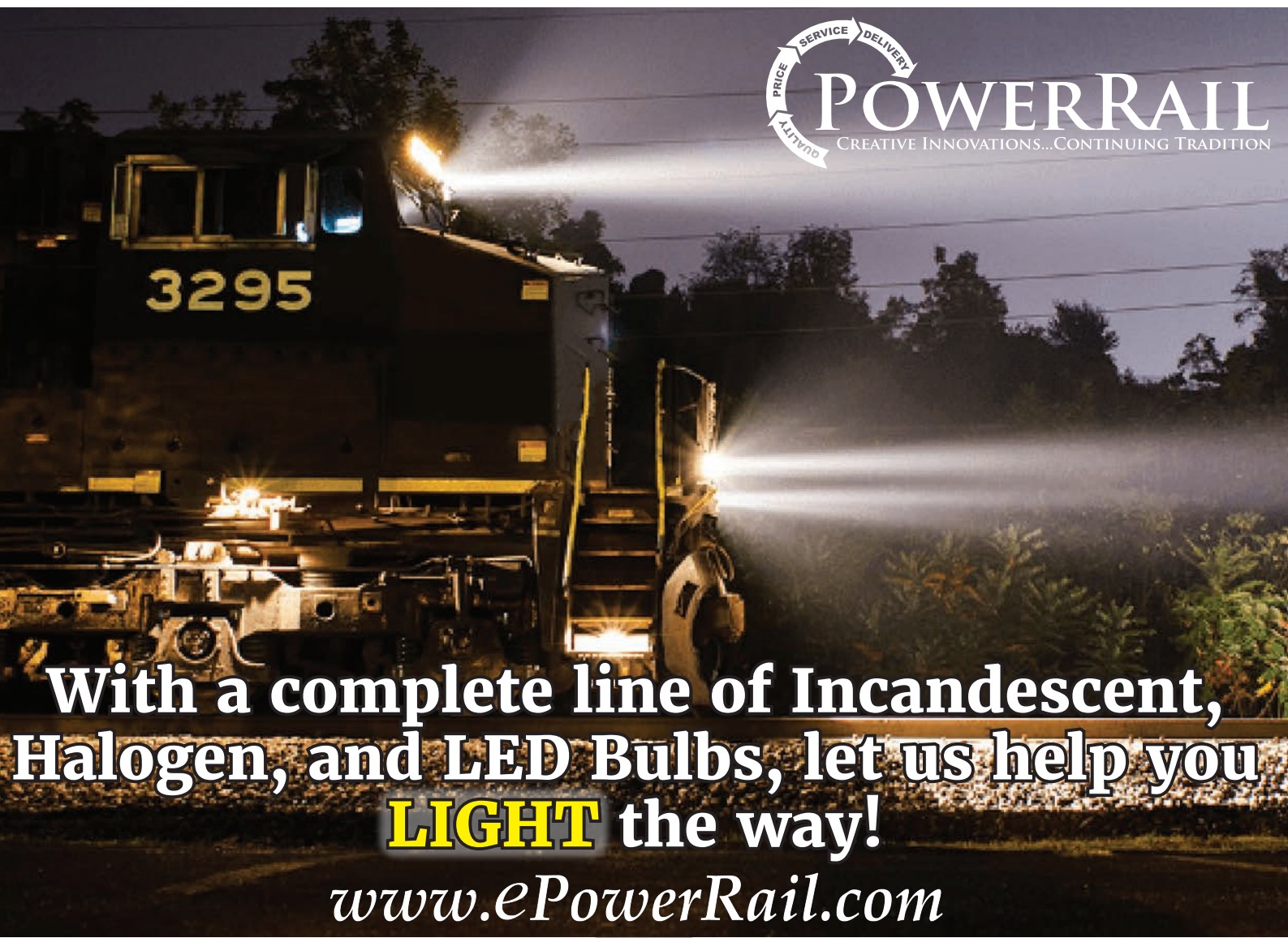
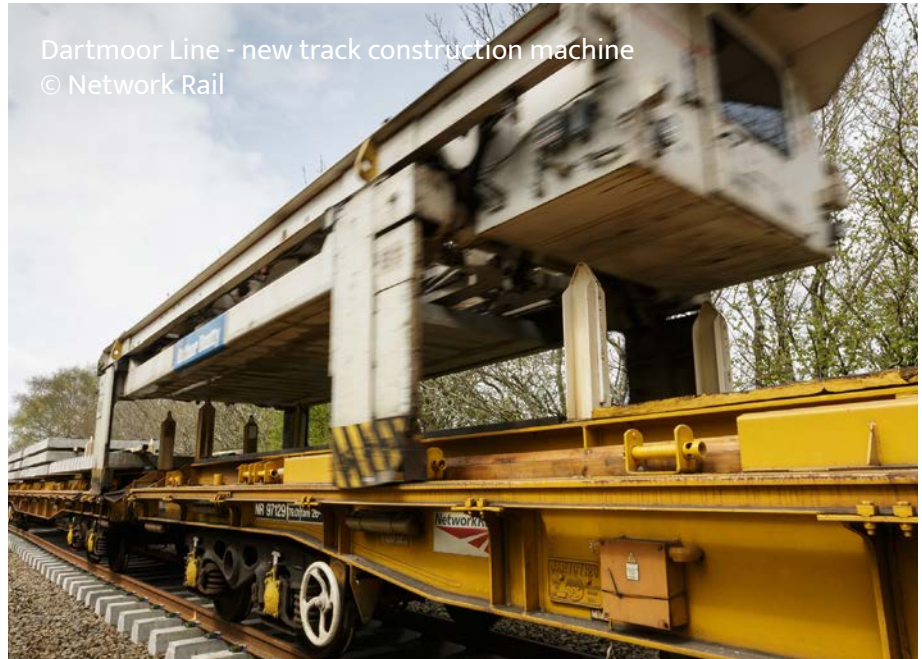
Having announced 589m GBP in funding for upgrades to this route last July, the DfT announced a further 317m GBP for the TransPennine Route. However, there was a lack of detail specifying what this funding would be allocated to.

## Dartmoor Line Upgrade Works

After the government announced that funding would be made available in March, engineers started working on upgrading the 14 miles of track between Okehampton and Coleford Junction, where the Dartmoor Line joins the existing railway line into Exeter. As part of these works, Network Rail have laid 11 miles of new track

and installed 24,000 concrete sleepers using an NTC (new track construction) machine. Rail services to Okehampton are to resume by the end of 2021. Journeys between

Okehampton and Exeter will take around 40 minutes, with trains every two hours each way, seven days a week.



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LNER Azuma on the ECML © kitmasterbloke



# The Government's Plans to Reform Britain's Railways

On 20 May 2021 the UK government published Great British Railways – *The Williams-Shapps Plan for Rail*. The positive take-away is, many of the ideas in this white paper are broadly good and show a real awareness of the problems the sector faces.

## Some Background

The Williams Rail Review was originally launched in September

2018 following the disastrous timetable change. However, the arrival of the coronavirus pandemic and the associated restrictions on movement led to an almost complete collapse in passenger numbers. Under the existing franchising agreements with train operating companies, the revenue risk lay with the franchisees.

In order to keep services running for essential workers – highlighting rail's system-critical role – the British government first implemented Emergency Measures Agreements and then Emergency Recovery Measures

Agreements by which train operating companies were (and still are) paid a management fee for running services, but with revenue risk handed over to government (except for some revenue sharing arrangements where appropriate). The situation demonstrated the failings of the franchising system, which was already struggling, evidenced, for example, by the collapse of the East Coast franchise.

This plan, then, aims to address that and other issues faced by Britain's railways. Importantly, it expects that much of old passenger demand will return:

*“Millions of us, imprisoned in front of flickering screens, yearn for human contact. Employers and businesses know that creativity, collaboration, and deal-making are best done in person.”*

The white paper also acknowledges that without the railways “our cities would not function, critical freight connections would be cut off, carbon emissions and pollution would rise, and mobility would fall – not just for the millions of people without cars, but for drivers too, as the roads became clogged”. Its conclusion: there needs to be somebody in charge – one network under single national leadership.

Importantly, the white paper voices a commitment to growing passenger numbers and increasing the size of the railway network. It expresses support for rail freight and open access operators. It is keen to emphasize the role of the private sector. “Simplification is more important than nationalisation” is one of its headlines – and this is a fair point. The rail market has many, many different players in it, even before including the supply chain. This aspect makes decision-making slow and changes more expensive.

For the first time, there will be a 30-year strategic plan in order to tackle the lack of direction. Bringing track and train – though not rolling stock ownership – under one roof will help cut down on the

fragmentation and lack of direction the sector faces.

There is a nod to active travel as well with a stated commitment to making it easier for passengers to leave their bicycles at stations and for there to be more spaces for bicycles on trains so passengers can complete their end-to-end journeys.

## The Key Proposals

1. A new public body, called Great British Railways, will own the infrastructure, receive fare revenues, run and plan the network, and set most fares and timetables. Network Rail will be absorbed into this body, as will many functions from the Rail Delivery Group (RDG) and the Department for Transport (DfT).
2. A new brand identity with national and regional sub-identities.
3. A simplification of tickets with standardised digital ticketing as well as affordable Pay As You Go fares – in the style currently successfully used in London – and new flexible season tickets.
4. Trains will be co-ordinated better with other modes of transport such as buses.
5. An end to franchising and a move to concessions. The expectation is for there to be much more competition for these concessions than there was for franchises. These new contracts will be called Passenger Service Contracts.
6. A statutory duty by Great British Railways to support rail

freight with improved track access rights.

7. A significant change to the role of the ORR to help improve accountability, transparency and efficiency.

## What Will Great British Railways Do?

Under the government’s plans, Great British Railways will develop both a 30-year strategic plan – the Whole Industry Strategic Plan to be published in 2022 – set by ministers and 5-year business plans. It will manage the railway budget and be in charge of delivering the government’s priorities for rail. A positive aim of Great British Railways is the end to stop-start funding long lamented by the supply chain, due in part due to the absence of a long-term vision. This plan will also include costed options to decarbonise the whole rail network to meet the net-zero commitment, noting that “electrification is likely the main way of decarbonising the majority of the network”.

Among the key problems identified in the white paper were a lack of clear accountability and fragmentation in the sector. This new body aims to address both of these with whole-system planning and operations. Finances will be brought together across track, train and the rail estate. Ultimately, this will unite costs and revenue.

Interestingly, the white paper contains this snippet: “Great British Railways will need to include meaningful numbers of people in middle and senior management

roles with substantial experience outside Network Rail, including in some cases from outside the rail and transport industry altogether; and more people with retail and customer relationship experience.” The aim here is to prevent a continuation of the culture that currently exists at Network Rail and bring about actual change.

Great British Railways will have five regional divisions that will be “responsive and accountable for their whole system in their areas, including budgets”. The regional boundaries of these divisions will be able to evolve over time, should the need arise.

## What Will a Passenger Service Contract Look Like?

Under the concession-based Passenger Service Contracts, Great British Railways will specify service

levels and set fares as well as take the revenue risk. The train operating companies will receive a fee for operating services. Great British Railways will also specify branding.

Under the old franchising system, TOCs designed their own timetables and set many fares. They also held the revenue risk. This meant that competition for franchises was based on “complex and uncertain revenue forecasts”, which resulted in low numbers of bids. In fact, the paper notes, since 2012 around 2/3 of contracts have been awarded without competition.

There will be a stepping stone to the Passenger Service Contracts. These will be National Rail Contracts taking over from the emergency agreements put in place during the pandemic.

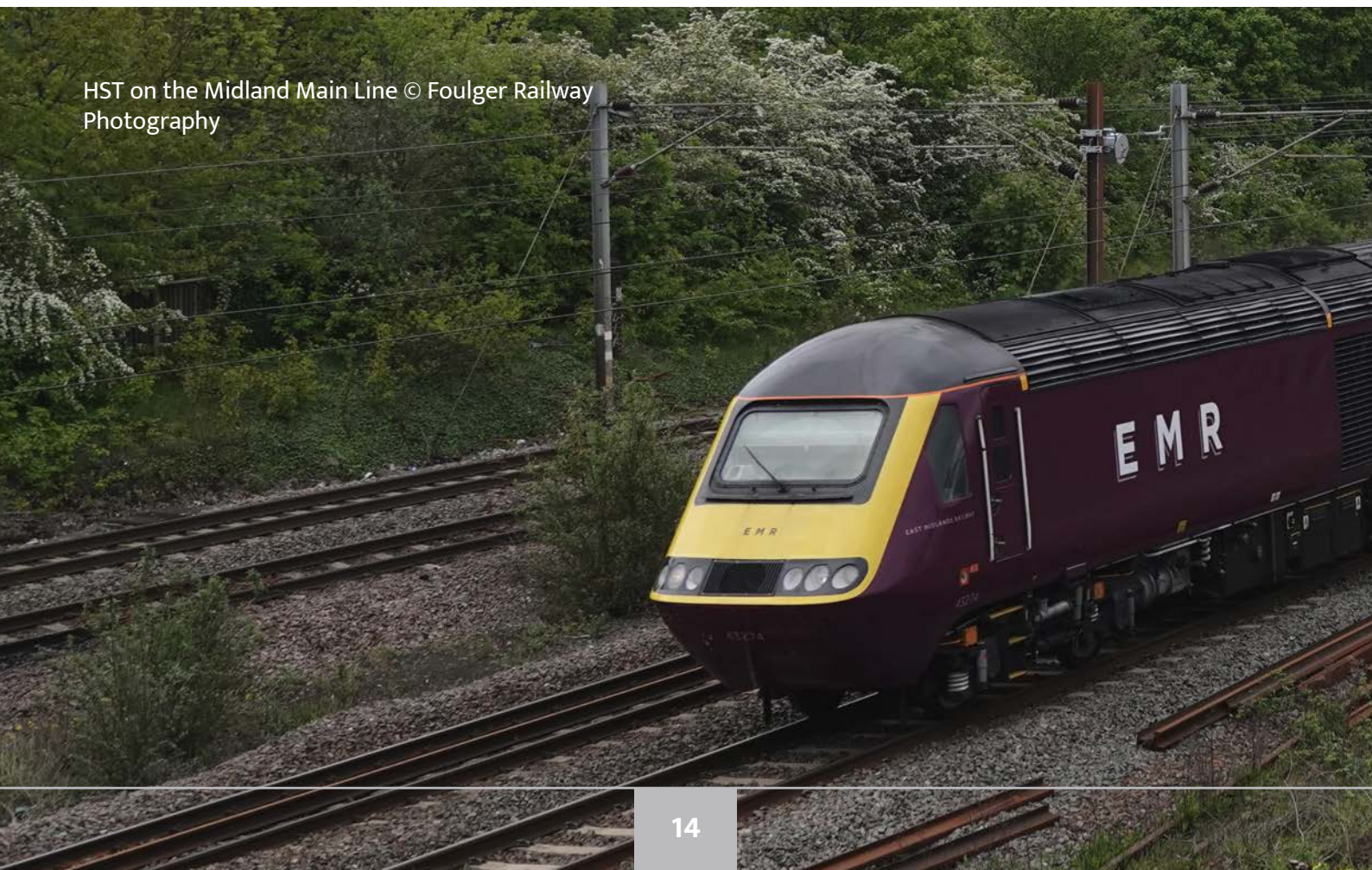
A key aspect of the Passenger Service Contracts will be that

operators will get paid performance incentives on top of the fixed fee for running services. These incentives will be based on quality of service, punctuality, the passenger experience, revenue protection and train capacity. There will be revenue incentives to encourage TOCs to drive growth in passenger numbers. There will be scorecard linked incentives for collaboration and innovation. Interestingly, targets will not be fixed over the contract terms. Instead, they will be flexible. This will address an issue with the current franchises where almost all of the investment came early, not taking new technologies into account.

## Something Missing?

The white paper addresses the desire to achieve good value for money for taxpayers and passengers at length. It talks about lowering and reducing costs, managing costs and achieving cost

HST on the Midland Main Line © Foulger Railway Photography



efficiencies. One area it does not touch on is rolling stock companies (ROSCOs) – the private companies that own Britain's rolling stock and lease it to the train operating companies. They are an additional layer in the system that could have been brought in-house, into Great British Railways, to bring the rolling stock more in line with the aims of this white paper without the additional cost and bureaucracy of this middleman. The three established as part of rail privatisation in Britain were Porterbrook, Eversholt Rail and Angel Trains.

A further aspect that the white paper does not mention is modal shift. It talks about growing passenger numbers and the network. However, growing both of these could leave the percentage of passengers travelling by rail roughly the same, with the same percentage increase in both network size and passenger numbers. A truly revolutionary

move would be a target of doubling rail's modal share from its current ~10% to 20% for both passengers and freight.

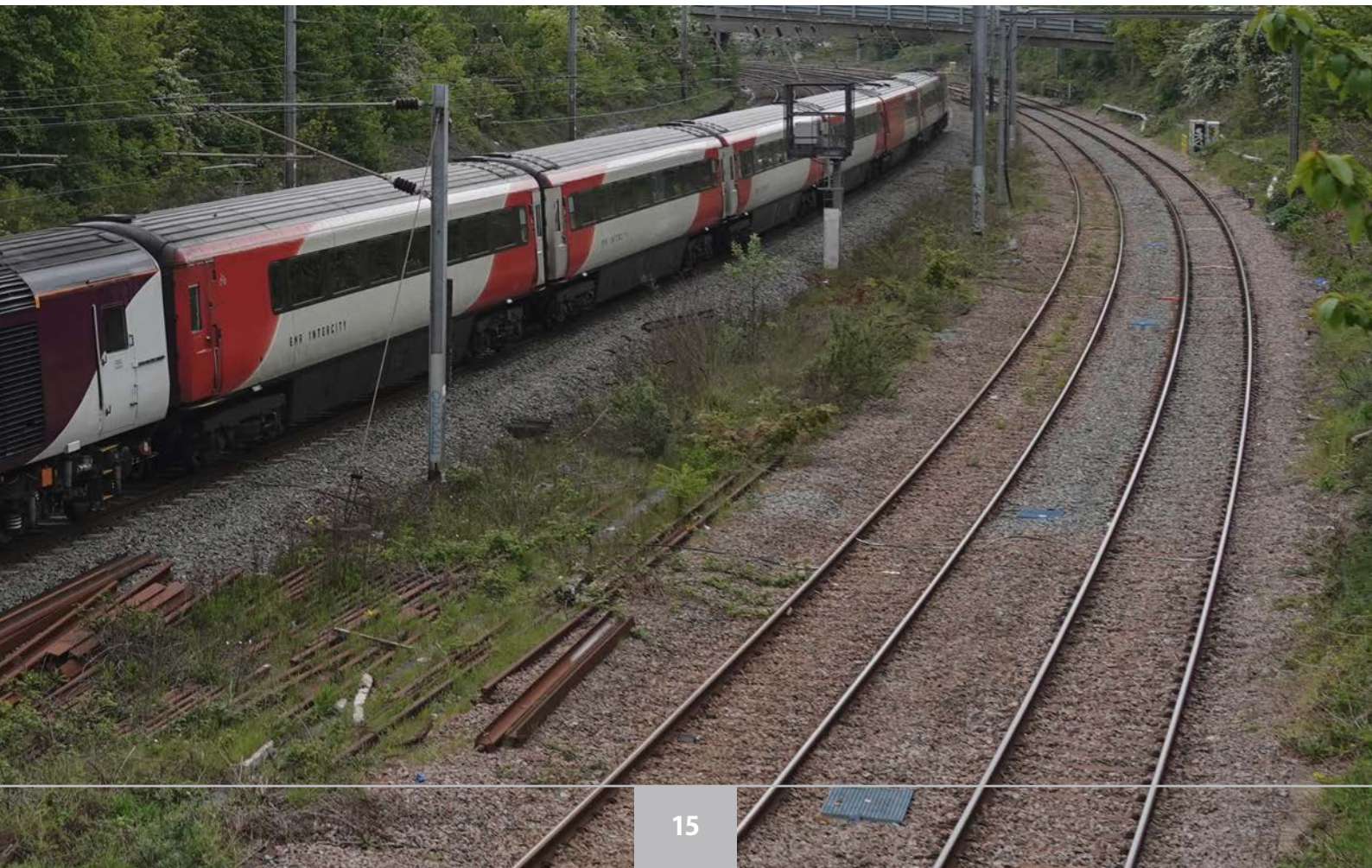
## Conclusion

The ideas and plans laid out in this white paper are broadly good and will do much that is positive for the rail sector. Moving to a concession-based model is good. More accountability is good. More long-term planning is good. Growing passenger numbers and the rail network is good. But a word of caution. These ideas need to be implemented well. A centralised body that supports the wrong

developments will not improve the railways. A centralised body that does not, for instance, support a rolling programme of electrification in line with Network Rail's recommendation that 86% of the as-yet unelectrified track would be best served by being electrified would still leave the railway in a poor state. A focus on re-opening lines that the government closed over the 20th century, and primarily in the 1960s rather than building lines where they are most needed today (which may or may not be different) would be misguided. This white paper presents the new structure of the railways in Britain. May that structure be a force for positive change.



A freight train at Slindon © Steve Jones



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Aluminium Rail Containers

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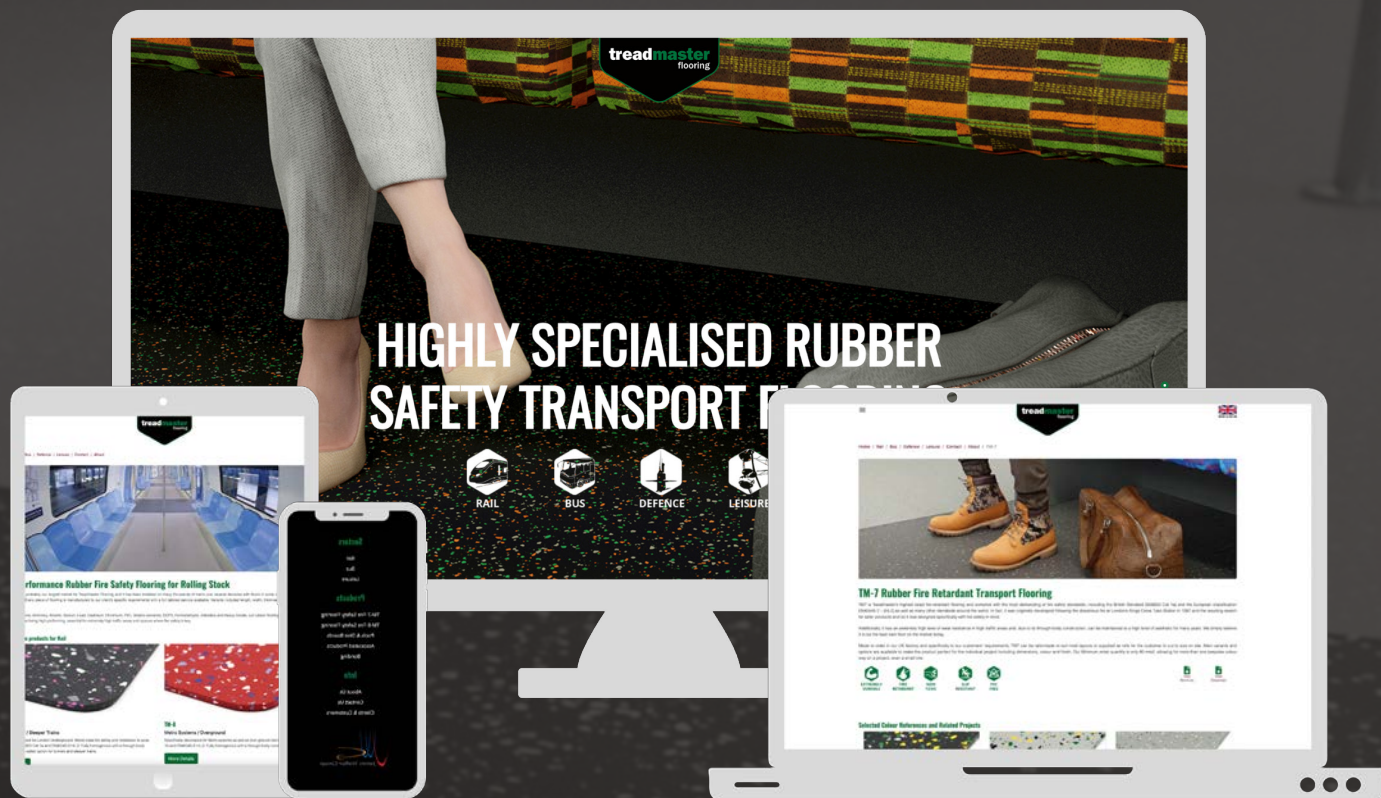
## Treadmaster Transport Flooring Specified on New Trains for East Midlands Railways (EMR)

Tiflex Ltd are pleased to confirm that its market-leading industrial safety flooring has been chosen by Hitachi Rail for the new trains being built in the UK for EMR. Its TM8-grade rubber flooring, manufactured in Cornwall, UK, has an extremely high wear resistance and world-class fire safety properties. A unique and exclusive colourway has been created for the new trains – a brand new bi-mode (electric/

diesel) version of the Hitachi AT300 intercity train – and due to its homogenous construction, the flooring will continue to look clean and bright for many years despite the expected heavy traffic.

In total Hitachi Rail will build a fleet of 33 new trains in their manufacturing facility in County Durham. The new state-of-the-art intercity trains, named by East Midlands Railway users as ‘Aurora’,

will start operating in 2022 and will serve the main cities and towns on the Midland Main Line including Sheffield, Chesterfield, Nottingham, Derby, Leicester and Lincoln as well as Kettering and London St Pancras. Tiflex has a long history of working with Hitachi Rail in the UK who like to support British companies in their supply chain and have supplied products for several high-profile projects over recent years.



# Treadmaster Launches New Website!

Treadmaster is a very well-established brand of industrial and transport safety rubber floors with years of proven high performance. Manufactured by Tiflex Ltd (experts in specialist rubber production) entirely in our own factory in the lovely county of Cornwall, UK, our floors have outstanding performance in terms of wear resistance and world-class fire resistance tested to the highest possible standards. All flooring is manufactured to the customers exact requirements from rolls to tailored sheets. The rail sector is probably our largest market for Treadmaster Flooring and it has been installed on many thousands of trains over several decades with floors in some carriages over 40 years old still in operation today. Every piece of flooring is manufactured to our clients' specific requirements with a full tailored

service available. Variants include length, width, thickness, colour and even chip size and ratio. We have a large and auspicious customer base and have worked with some of the world's leading manufacturers of rolling stock, including Bombardier Rail, Alstom, Siemens Mobility, CAF, Stadler, CRRC and Hitachi.

With many developments and iterations over recent months the old website was somewhat lacking in terms of showcasing our full offer and so we set about designing a new one. In an online world and with the obvious COVID-19 restrictions it is critical that we communicate to our customers and potential customers as efficiently as we can. We believe the new site is more comprehensive whilst being easier to navigate. It covers all the markets we work in, not just Rail and rolling stock. You will see a fresh

landing page that welcomes you to our company and brand, with a new layout that is more user-friendly and easier to use on the move, e.g. via mobile phone or tablet. Within a few clicks you can find yourself browsing through our rail, bus, leisure or defence sections.

You can view many of the products in our flooring portfolio as well as bonding options and associated products such as covings, cornices, treadplates, sealants, nosings and pictograms. It will give you a good overview of the services we offer in relation to our bespoke tailoring service.

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## Successful Graffiti Removal and Prevention: Sustainable as a Basic Standard



### Get Rid of Graffiti Straight Away!

Rolling stock is the preferred target of rebels 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! And take good care of your reputation at the same time.

Customer expectations are high, when it comes to feeling comfortable and safe. The feeling of security plays a major role for customers, especially at train stations and in public places. All the efforts of the railroad companies are very much appreciated there

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

### Successful Removal in Challenging Locations

Graffiti artists are very creative in leaving their art in hard-to-reach places. BIOforte can rely on an experienced and skilled team that can do a great job even in unusual locations. Whether along railroad tracks, on bridges, in underpasses, on building façades or even monuments, art objects or towers, BIOforte is happy to restore cleanliness. BIOforte removes unsightly infestations of microorganisms on all kinds of materials such as masonry,

concrete or Eternit, and will deliver protection against new infestations (5-year guarantee). BIOforte can also offer convincing results for the removal of chalking from metal façades, incl. paint refreshment and graffiti protection.

## Good Preventive Care Pays Off

*“Good, prompt planning saves money, effort and frustration,” says Udo Mannartz, CEO and Founder, 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.

## Use of Sustainable Products & New Technology Coming Up for Easier Handling

At the request of customers and because it is the company's aim to take care of people, the environment and materials, we at BIOforte only use environmentally friendly and resource-saving products – biodegradable and free from microplastics and VOCs. And soon a new era for graffiti cleaning products awaits us with the new tab technology. It offers the advantages of lower storage costs, less waste and with a CO2 reduction in the entire logistics chain, the products remain convincing with the same strong cleaning power and easier handling.



## NextGen in Place

Anja Mannartz and Filippo Elefante, NextGen at BIOforte, have already gained many years of experience in this specialised field and are now ready to support leading the management into the future. *“The situation with graffiti is similar all over the world and we see our role in providing a contribution to making the world a cleaner and safer place in the future,”* says Anja Mannartz, COO of BIOforte. *“This is where our long-time expertise of BIOforte 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,”* Anja Mannartz adds.



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**10<sup>®</sup> Years BIOforte**  
**Surface Specialists**  
**Naturally strong!**

### 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 biodegradable, high-performing removal and protection products tried and tested in a wide variety of situations and approved by major railway companies
- Training, advice and sales of professional products and equipment
- 20 years of experience across Europe with an extensive list of references

# TEXELIS

## Texelis's Modernisation & Maintenance for Mobility Sub-Systems

Laurent Garnier joined Texelis in 2009 as Purchasing Manager. His extensive industry experience has significantly contributed to Texelis's transition to an integrated company specialising in axles and mobility systems. In this article, Laurent, who was appointed Managing Director of Transportation Business Unit in 2019, gives his insights on the company's future outlook, its services and expertise.



### Adjusting to Uncertain Times

The Covid-19 outbreak had a major impact on the rail industry. As a result of the global pandemic, there has been a virtual shut down of international travel and many sectors of the economy where Texelis does major business. The entire industry of rail production and transport has had to adapt to these changing conditions. Clients have become less willing to purchase new products and instead have shifted their focus to repurposing and improving much of their existing equipment.

The Managing Director of the Transportation Division at Texelis, Laurent Garnier, explained the challenges that the industry is currently facing: *"A lot of our customers are facing a situation where companies' annual revenues are lower than they were 2 years ago due to declining production, which is forcing them to focus more on operating costs. Many customers are now placing increasing emphasis on extending the lifetime of their existing trains."*

Texelis has been quick to adapt to these changing market forces and has been at the forefront of the industry in adjusting their business model and sales strategy to meet the new demands of its customers.

Laurent added, *"Texelis has seized the opportunity to offer full-service delivery of mobility that are designed to maximize product lifespan, support customers'*

*operational readiness, and enhance the customer experience with innovative, custom solutions. We've actually achieved considerable success."*

To meet the new needs of its clients, Texelis has tasked its most skilled engineers and high-tech facilities with the maintenance, upgrade and repair of existing mobility systems including bogies, gearboxes and wheelsets.

One of the major places where this is taking place is at Texelis's operating site in Limoges. The Limoges site has a high-tech support facility for the refurbishment and technical upgrade of various passenger mobility systems. All of the equipment at this site and other similar sites performs at optimal efficiency, with comprehensive diagnosis of cracks, wear, noise, sealing, etc. Texelis's renovations



include repainting, corrosion protection, and fully verified renovated upgraded parts with certified testing devices.

In keeping with its services focus, Texelis's highly skilled and experienced engineering and technical support staff are working ceaselessly to perform specialised improvements of used materials, including expertise and analysis of mechanical systems or drives. This expertise can determine the scope of any repairs needed, assess the level of wear and tear on specific components, and identify the technical upgrades required during asset maintenance.

**Laurent notes Texelis's long history of expertise in serving the rail industry:** *"Over 70 years of experience in engineering, producing, and maintaining mobility systems enables us to solve the most complex problems and detect the most minute deficiencies, bringing the ultimate value to our customers."*

Recently, Texelis has finished

overhauling the axles of the 402 CITADIS trains in the Grenoble fleet, which went into operation in 2009. This great achievement is a perfect example of the ingenuity and expertise that Texelis's customer base has come to rely on.

Texelis's success comes from its devoted and skilled employees. *"As a provider of mobility solutions, constant innovation is the source of Texelis's dynamism and competitiveness."* Laurent says, *"An essential element to spark creativity is having a group of passionate and talented employees."*

Texelis is focusing on reliability and availability – developing highly innovative technical solutions to respond to the changing mobility needs of our customers in terms of safety, design, quality, and comfort.

Texelis's engineering team can upgrade and check components and functions to perfectly match the original performance requirements, as well as offering obsolete management solutions and cost-reduction programmes for

equipment nearing the end of its service lifecycle.

In addition to its focus on modernisation, overhaul and repair of existing products, Texelis has also put a lot of efforts toward supporting its clients with after-sales services. Customers trust Texelis to not only produce and repair their products in the most effective way possible, but they feel assured that if any product issues arise in the future, Texelis will be there to ensure quick and successful resolution of those problems.

Texelis has established a dedicated global after-sales service network to support its customers wherever they are located. We have a network of local experts trained in the maintenance and repair of mobility systems to provide fast-response, on-site customer support on five continents. Texelis's service does not end with system delivery, it supports operators and maintains systems to ensure customers get the most from their assets through Texelis's global partner network. Texelis's customers have been

extremely satisfied with the work it has done over the past year and the support it has provided during these changing times.

**One of Texelis's main customers described their experience working with us:** *"We chose Texelis because its offer included a schedule that was perfectly adapted to our operating constraints and we know we can always count on Texelis's professionalism to support us as an expert in the field."*

As a result of the consistent satisfaction of its customers, Texelis has won several contracts despite the lockdown period. These include a contract for the overhaul and upgrade of the driven axles for the entire fleet of Citadis trams currently in operation in Jerusalem and the agreement for the overhaul of the driven and trailer axles of Nottingham Citadis trams. To keep

its customers functioning at their highest capacity, Texelis will also undertake new overhaul operations in Ireland from May 2021 to October 2022.

Texelis has adapted to the changing needs of its clients and it continues to provide the best service in the entire industry. Although this pandemic has caused a slowdown in the production of new materials, Laurent believes that this pandemic will end up creating positive growth for Texelis and a new awareness of the importance of environmental issues.

**Laurent would note:** *"The pandemic has had a major effect on our customers. The demand for trams has declined. Our business has no doubt been affected by these changes. This is the short-term impact of the pandemic on Texelis. In the long term, however,*

*as a result of this pandemic, people will become more conscious of the environment and the impact of their actions on the environment. This will have a positive impact on our industry, whose goal is to minimise the environmental footprint of the trains."*

Amidst the uncertainty that our communities still face, Texelis stands firm in support of all those affected by this pandemic. To meet the transport challenges of the future, Texelis will consistently adhere to the highest service standards in the rail industry and provide first-class maintenance for the rail vehicles worldwide – from metros, trams and people movers to unmanned systems, while further improving the sustainable performance of its products. Texelis looks forward to an amazing future supporting the transport needs of peoples around the world.





 Directory  
 Rolling Stock

# Train Scanner

## The Service Product Developed by VR FleetCare to Automatically Detect the Condition of Trains in the Future

The Finnish rolling stock maintenance company VR FleetCare has launched Train Scanner, a new service product designed to automatically inspect the external condition of trains.

In addition to enhancing inspection activities and improving safety, the objective of using Train Scanner is to lower the lifecycle costs of rolling stock. With the help of automated scanning, inspecting the train's condition will be quicker and the inspection quality will improve.

Up until now, VR FleetCare's Train Scanner has only been used in passenger trains but due to its scalability, the device can be used to inspect any rolling stock. In border control, for instance, Train Scanner could be used at border stations to automatically detect whether the size of a wagon adheres to the local instructions or used to verify the safety of wagons.

### Machine Doing the Work

A large part of rolling stock maintenance is manual inspection performed by human eyes, and the

objective is to proceed towards automated and systematic processes.

Train Scanner is based on machine vision, shape recognition and artificial intelligence. The train's sides and roof are scanned using a line camera with very high line rate speed and resolution. The resolution is approximately a few millimetres. The data from the scanner is instantly processed by means of edge computing that analyses the data and reports any deviations. The information is available to the owner and maintainer of the train within 10–20 minutes. The data is

also stored in a cloud service for further analysis.

## First Scanner for Customer Use in June

Train Scanner has now been piloted for one year and in June, the first customer will implement the device. In the future, the commuter FLIRT trains in Helsinki will be inspected by driving the trains past the scanner.

### Project Manager Samuli Suuriniemi from VR FleetCare explains:

*“The line rate speed and resolution of the camera could be compared to photo-finish cameras used in sports competitions, for instance. We have taught the device how a train should look so that it can detect any possible deviations. Artificial intelligence becomes increasingly more accurate based on the feedback it receives from humans. The final objective is to be able to reliably detect any rolling stock malfunctions in such a way that human-performed inspections are no longer needed. The time saved can be used to repair the malfunctions instead of searching for them.*

*The algorithm’s accuracy is developed and improved every time a train passes by.”*

*“The device is now ready for its first customer. The technical solution that we used to begin the pilot was working extremely well, and the imaging technology that we implemented during the pilot is still being used now. Our most recent development includes making installation easier and weather-proofing the device,”* Suuriniemi says.

## Affordable and Easy to Implement

By using the scanner, it is possible to standardise the inspection of train exteriors. Because the inspection is always uniform, automated scanning also improves the reliability and quality of inspection.

*“There are various benefits related to implementing the system. The condition of rolling stock is constantly assessed, and safety is improved as the system can detect the malfunctioning components of a bogie, for example. By utilising the available data, it would also be possible to accurately define maintenance intervals. Inspection intervals could also be easily increased,”* Project Manager Samuli Suuriniemi from VR FleetCare says.

Train Scanner is not a completely unique invention. A few devices with similar user purposes already exist on the market.

*“The prices of the devices available on the market are quite high, and their installation requires extensive construction work. Our intention has been to develop a cost-effective solution that is scalable and possible to implement quickly,”* Vice President of Digital Services Mihail Lipiäinen from VR FleetCare explains.

“Automated inspection of rolling stock will be one of the most important changes made possible by the current technology, and the benefits for the owner of the rolling stock include improved quality of maintenance and better usability of the rolling stock. Based on the results obtained so far, we know that the technology is working, and we can provide Train Scanner to our current and new customers during the year 2021,” Lipiäinen believes.

## Train Scanner as a Service Product:

- As the owner of rolling stock or maintainer of tracks, you certainly want the rolling stock on the tracks to be safe, well-functioning and clean in appearance.
- The solution is an easy-to-install and deployable open service that is affordable compared to the benefits gained. Train Scanner is suitable for the observation of all types of railway rolling stock.
- 6,600-millimetre-high poles with scanners are installed on both sides of the track and used to scan the train that drives by. By using the collected data, it is possible to automatically detect deviations, such as broken parts, graffiti or incorrect loadings.
- The technology of the scanner poles scans the train’s roof, bogies and vehicle group from both sides. The resolution is approximately a few millimetres.
- Train Scanner decreases the amount of manual work and allows you to inspect large amounts of rolling stock

accurately and efficiently. The device makes it possible to proceed from reacting to prevention in the repairing of rolling stock malfunctions.

- Train Scanner can be integrated into the customer's existing systems. Reports can be adapted to suit the customer's individual needs.
- Train Scanner can be installed practically anywhere with trains passing by.
- Train Scanner can be used in different speed limit areas, but the best and most accurate results are achieved when scanning trains driving by at a lower speed.
- Implementing Train Scanner enhances inspection activities and improves inspection quality.



# We are on the same track



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years of  
experience

**1000**

top tier  
experts

**100**

different types  
of rolling stock

**1500**

different  
components

**400**

rolling stock units  
under condition monitoring

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# What do you do to prevent catenary tearing incidents?

**Detect, Analyse to Prevent and Act!**



Robust  
Affordable  
Easy to install

This small and compact system monitors the state of the pantograph and sends only the information needed for the defect alert.

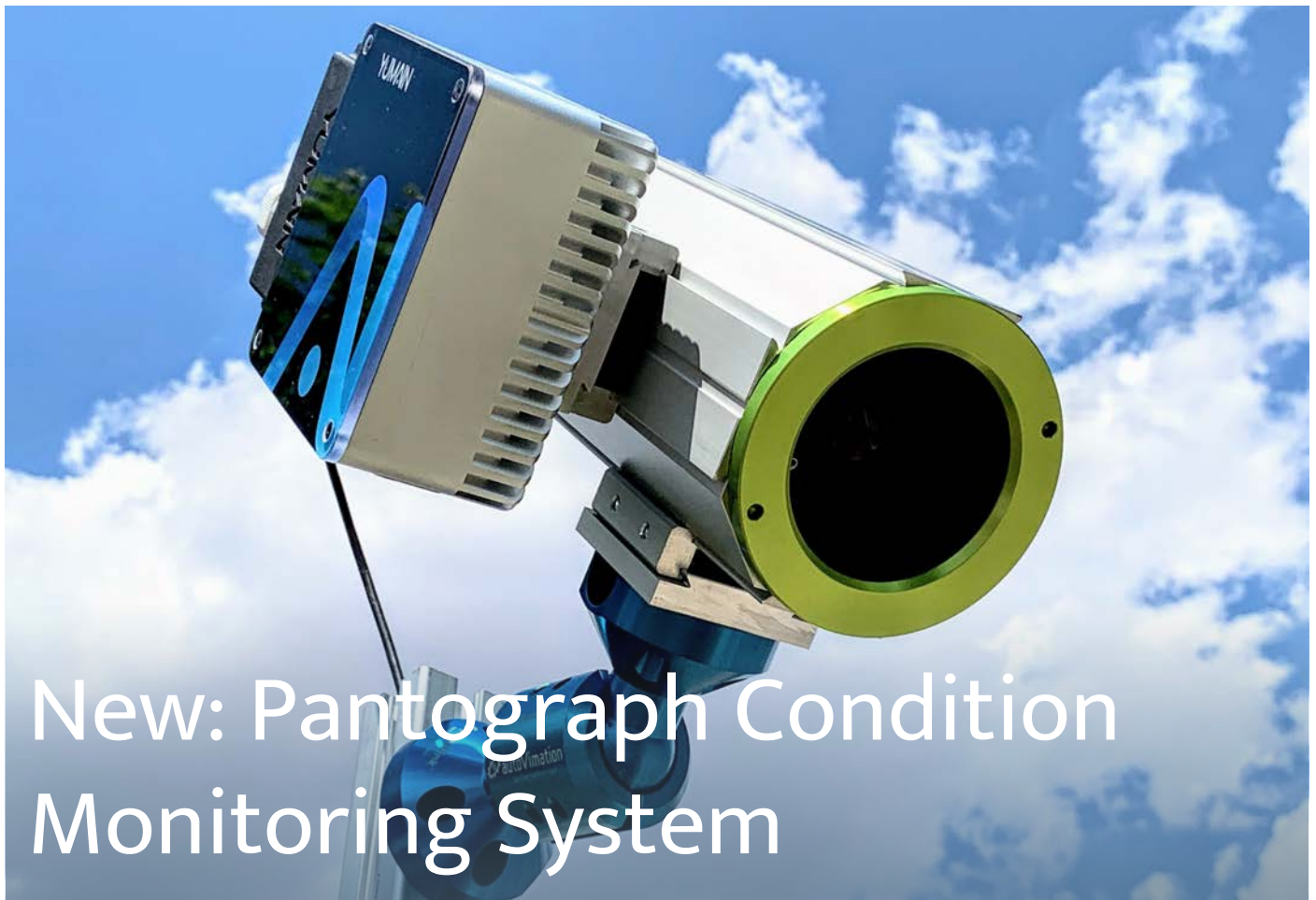
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# Yumain



## New: Pantograph Condition Monitoring System

Yumain introduces an intelligent device that processes and analyses the state of the pantograph in real time and sends an alert when a fault is detected. This embedded AI sets a new standard for predictive maintenance and guarantees the end of catenary tearing incidents.

### Fault Detection

Automatic detection and identification of the train as soon as it passes under the sensor (train speeds can reach up to 160 km/h). The following items are analysed:

- Pantograph location (folded or unfolded) and counting
- Pantograph Integrity Analysis: Absence/Presence of Horns and Offset
- Analysis of the integrity of the friction strip: scales, cracks, and grooves
- Homogeneity and thickness of the carbon slide plate.

As soon as a fault is detected, an alarm is generated and sent to a rail network operator.

## Intelligent Device

Yumain's system uses an AI (Deep Learning) based architecture. Processing, analysis and alert sending are done in real time.

## Plug and Play

Simple installation and commissioning.

## Connected Alarm System

Alert sent via 4G communication to any rail network operator.

## Data Security

Alarm sent only when faults are detected. AI embedded in the sensor, the decision process is realized in the sensor.

## Optimized and Controlled Maintenance Costs

Very attractive sensor prices allowing the multiplication of control points on the rail network. Operates on trains in service so there is no need for manual inspection.

## Save Time and Money

The extremely compact size of the sensor makes it easy to install and integrate into the environment. Two sensors above each track are required for optimum performance.

Installation, calibration, and implementation can be carried out by 2 people and does not require any special equipment or machinery.

As the tariff per measuring point is up to ten times lower than more complex solutions, it allows a multiplication of control points (e.g., station entrances) on the national rail network.

At each inspection point, the fixed sensor(s) capture high-resolution digital video images of each piece of equipment.

At the same time, the engine number is also read automatically. Real-time analysis (< 5 minutes) is then performed, and an alarm is then generated if necessary, and transmitted by email.

## Robust and Reliable

The device for automatic pantograph analysis is based on combining the use of robust and mature algorithms, as well as filters applied by image processing.

The Yumain solution is designed to be robust and industrial in order to respond to the major problem of overhead lines being torn out by defective pantographs.

## Pantograph Satisfactory

The embedded artificial intelligence coupled with image processing on a deep learning basis monitors the detected pantographs for compliance and locate faults. The process entails locating and detecting the presence of all horns and the location of contact strips.

Moreover, it verifies that the

pantograph is perpendicular to the train's axis. In this image the state of the pantograph is satisfactory.



## Pantograph Damaged

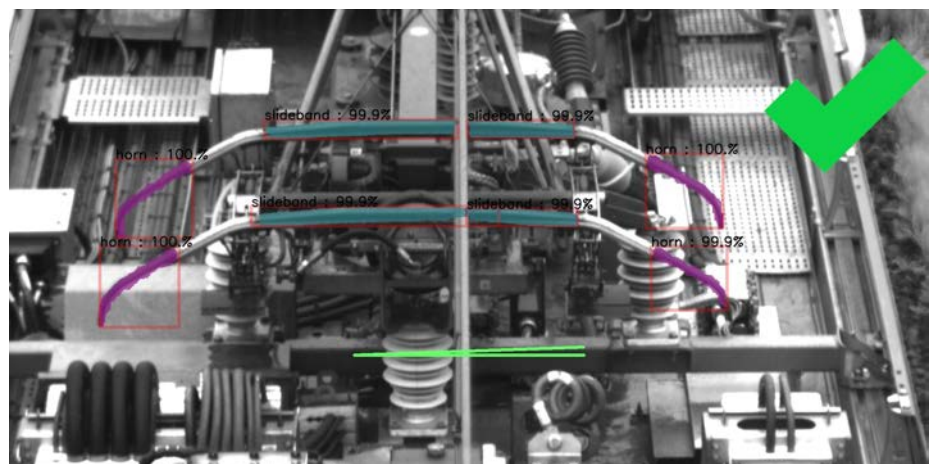
The embedded artificial intelligence monitors the detected pantographs for compliance, if the pantograph is tilted or damaged, the ECS sends the non-compliance alert to the operator in less than 5 min, via the 4G network. It is also possible to add the feature of pantograph counting (raised/lowered). A tilt problem is indicated by red stripes instead of green ones.

✉ [contact@yumain.fr](mailto:contact@yumain.fr)

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# YUMAIN





# U-LIFT

U-Lift AB med huvudkontor i södra Sverige tillverkar och säljer rullstolslyftar och ramper för järnvägsapplikationer, samt minibussar, låggolvsstadsbussar och lätta lastbilar. U-lift är ett ledande företag inom fordonskomponenter med produkter för resenärer med nedsatt rörlighet.

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U-Lift AB based in South-Sweden develops and markets wheelchair lifts and ramps for railway applications, as well as for minibuses, low-floor city buses and load lifts for light commercial vehicles. U-Lift is a leading company in the automotive market with products for people with reduced mobility.

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U-Lift AB mit Sitz in Süd Schweden entwickelt und vermarktet Rollstuhllifte und Rampen für Bahnanwendungen, sowie für Kleinbusse, Niederflur -Stadtbusse und Lastaufzüge für leichte Nutzfahrzeuge. U-Lift ist ein führendes Unternehmen im Automotive mit Produkten für Reisende mit eingeschränkter Mobilität.

## U-Lift AB

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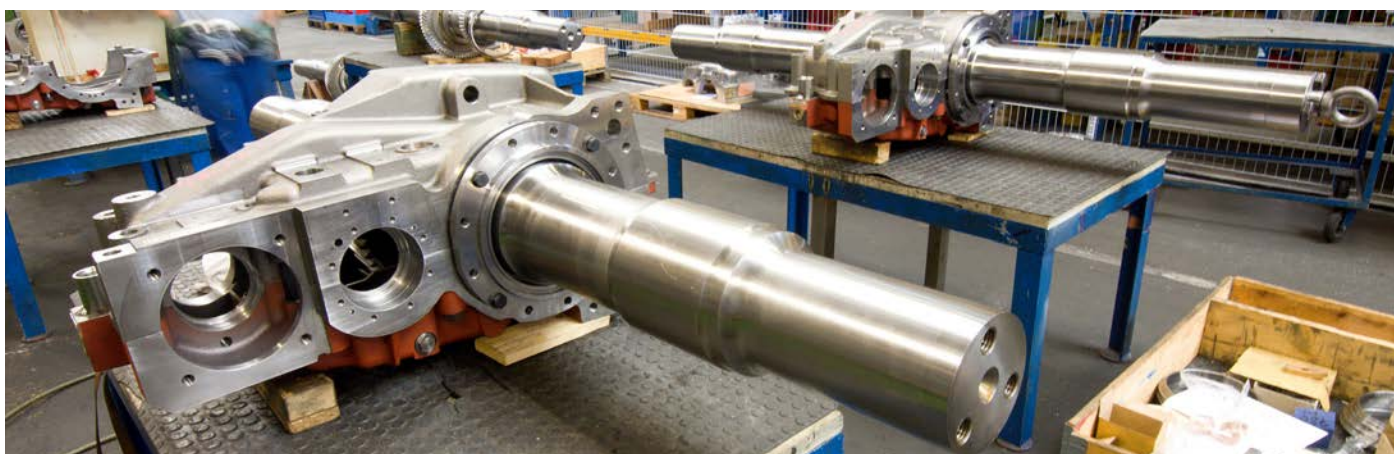


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# Gmeinder

## Over a Century of Tradition Represents Real Commitment



### Over a Century of Tradition Represents Real Commitment

GGT GMEINDER GETRIEBE-TECHNIK GmbH, situated in Mosbach, has a long history. It was the brainchild of two men, August Steinmetz and Anton Gmeinder, who started the company Steinmetz Gmeinder KG in 1913. Six years later, after one owner left, the company was renamed Gmeinder & Cie and focused on manufacturing small locomotives. It launched the first German diesel locomotive on to the market (1921), and developed and manufactured its own gearboxes. Soon afterwards (1932), it became the exclusive supplier of shunting locomotives for German railways.

Although the company changed its business name several times during the 20th century, it never abandoned the Gmeinder surname. In the early 21st century it sold its locomotive manufacturing division (2003), and focused its attention on manufacturing gearboxes for special railway vehicles, DMUs and locomotives. In addition, the company possesses the technology for manufacturing bevel gearing and generates a significant part of its income from repairing and servicing gearboxes for rail vehicles. In 2019, Gmeinder became part of the Wikov engineering group.

### Special Railway Vehicles

Gmeinder is a market leader in gearboxes and drives for special

purpose vehicles, railway cranes, track inspection vehicles, tampers, machines for track construction and renewal, maintenance vehicles, etc. The decades of experience and know-how of the Gmeinder company, passed down from generation to generation, is your guarantee of quality and reliability.

### DMUs

Gmeinder has gradually established itself as a supplier of complete drive solutions for the DMU market, up to a speed of 200 km/h. In the past, for instance, it also used to supply bevel gearboxes for the IC3 units of Danish railways. The portfolio also incorporates axle gearboxes, incl. those with shifting, for regional diesel units.

## Locomotives

Locomotive gearboxes are another significant domain for Gmeinder. In particular, this applies to shunting and freight locomotives across the entire design range – from diesel, through diesel-electric, to the nose-suspended mounting of electric locomotives.

## Other Products

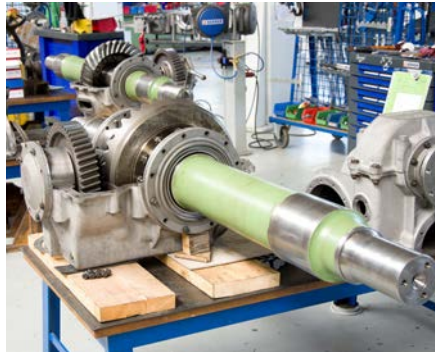
Last but not least, Gmeinder also supplies gearboxes for trams and EMUs. For trams this particularly includes bevel gearboxes for those with bogies that have freely rotating wheels. On the other hand, two-stage, fully sprung-mounted gearboxes with a hollow shaft are intended for big EMUs with speeds of up to 200 km/h.

## GearSaver®

GearSaver® is a complex diagnostic tool, primarily developed for the gearboxes of rail vehicles. Unlike competitive systems, GearSaver® only has a single sensor, which makes mounting a lot simpler. Still, this sensor is able to assess oil quality and its level, temperature, the presence of metal particles, and relative humidity in the gearbox. The measured values are sent off via a CAN bus-system to specially developed software for data evaluation. The entire unit can also be connected to the existing monitoring system in the vehicle.



The added value of the GearSaver® tool includes preventing fatal drive/gearbox damage, extending maintenance intervals, the possibility of shut-down planning, and reducing actual monitoring times.



## Multibrand Gearbox Service Expert

By possessing the latest technology and having decades of experience, Gmeinder offers technical, cost-effective and quality-controlled services. Gmeinder proves its competence, know-how and flexibility every day. Gmeinder's new service workshop provides optimal conditions for the handling of complete wheelsets. Gmeinder's scope of services includes the review and repair of wheelset bearings, wheels, brake discs, axles and transmissions.

## Conclusion

Today, the company GGT GMEINDER GETRIEBE TECHNIK GmbH rests on firm pillars. One of these is the more than 100 years of experience and know-how, another is its complete product portfolio for the demanding railway vehicle market; last but not least, its third pillar is a stable owner, which has been the Wikov Group since 2019. In this way, Gmeinder can dare to expand its business activities and also develop new, sophisticated products for the hybrid and electric railway future.

**Wikov Industry** is the largest manufacturer of industrial gearboxes and transmission equipment in the Czech Republic with a long manufacturing tradition (production began in Hronov in 1884, in Pilsen in 1918). At the same time, it is among the world's leading manufacturers of industrial gearboxes. The engineering group Wikov Industry began to establish itself in the market in its present form in 2002. In the Czech Republic, its subsidiaries include **Wikov Gear s.r.o.** in Pilsen (industrial gearboxes, high-speed gearboxes and gear wheels), **Wikov MGI a.s.** in Hronov (industrial gearboxes, gearboxes for renewables – wind and tidal power plants as well as drives and gearboxes for rolling stock), **Wikov Sázavan s.r.o.** (machine parts and engineering components) and **Detail CZ** (precision parts for trucks, construction and agricultural machinery). For the design and construction of planetary gearboxes, the group turns to its company **Orbital2**. The German company **GGT GMEINDER GETRIEBE TECHNIK GmbH**, which manufactures and services gearboxes for rail vehicles, became part of the Wikov group in 2019. That same year, the **Wikov – RS** plant for assembling rolling stock gearboxes was founded in the Russian city of Tver, as a joint enterprise between Wikov Industry and the Russian rolling stock manufacturer PKTS. At present, the entire Wikov Industry group employs over **1000 people**; its annual revenue lies at **120 million USD**. The entire group continues to be profitable over the long term.



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# Drive for Future Public Mobility

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# Wikov

## One of the World's Leading Manufacturers of Gearboxes for Rail Vehicles



Over the past 18 years, Wikov has developed from an occasional manufacturer of rolling stock gearboxes to a key player of Europe-wide significance with IRIS certification, capable of offering solutions for both small specific projects and supplying drives on a large-scale for the largest public transport companies in the world.

Moreover, Wikov is very proud of managing this achievement using its own production of key components in the Czech Republic, not by sourcing them from Asia

Systematic, intensive and long-term

effort within the sector has borne fruit: we have seen a manifold increase in the quantity and turnover of annually manufactured gearboxes and an expansion of the product portfolio to virtually every type of rolling stock.

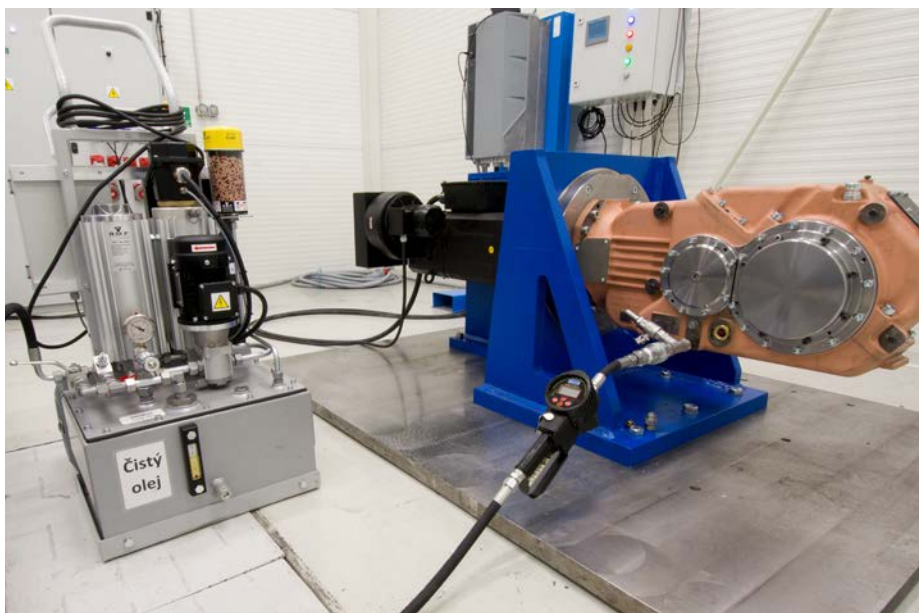
### Acquisition and Fulfilment of Local Content Requirements

In recent years, Wikov's main acquisition has undoubtedly been the takeover of the German rolling stock gearbox manufacturer, the

GGT GMEINDER GETRIEBE-TECHNIK GmbH. Purchasing the German company has meant an expansion of the product portfolio for special railway vehicles, locomotives and DMUs in particular. The Gmeinder company also has valuable experience and capacity in the service and modernisation of rolling stock gearboxes.

Furthermore, Wikov is open to other forms of acquisition activities to fulfil local content requirements.

So, in the spring of 2019, for instance, Wikov started assembling gearboxes intended for the Russian



market in the Russian city of Tver, in a joint enterprise with the Russian customer PKTS, with a minimum annual capacity of 1,000 gearboxes.

Another important enterprise is the WiKorea project, whose main content is assembling gearboxes for the Seoul Subway directly in South Korea. Although the project was suspended for a while owing to the coronavirus pandemic, its activities resumed in May 2020 in spite of bureaucratic problems.

## Product Portfolio

### Trams

Today, Wikov has a market-proven, complete series of gearboxes and drives for low-floor trams, for both undercarriages with an axle and freely rotating wheels, with gearbox outputs from 60 to 180 kW.

The salient feature of the low-floor tram market is its relative newness. Gradual consolidation is now underway, however, bringing temporary uncertainty to the component supply chain. From the point of view of a supplier of gearboxes and drives, this process is clear to see. With regard to drive

designs, there are roughly four groups of bogie types currently used in the world. The first group involves the use of the conventional axles, providing cross-mechanical linkage between wheels, while the second group is bogie without axles, but still with cross-mechanical linkage of wheels thanks to a special coupling shaft. The third group includes bogies with freely rotating wheels without axles, in which wheel linkage is ensured by electronic control – here designs with gearboxes or direct drive come into play. The fourth group includes single-axle bogies with a portal frame. The first three groups split into many other drive-type subgroups; therefore, it is very difficult to have a ready-made solution for every customer, let alone one that's been practically tested.

The simplification and consolidation of the market is also revealing particular trends. There is, for instance, an apparent increase in and, in fact, a return to simpler designs with a conventional axle and pivoting bogie. Wikov has gradually developed gearboxes for almost all types of drives used. Most of them can be backed up by market references, which gives it a

certain competitive edge.

### EMUs and Subway Cars

A much larger market is the manufacture of electric multiple units (EMU). Nowadays, 60% of the global market is held by three or four players. Having just a few players in the market, the situation is much more transparent here than in the tram market with regard to drive types; on the other hand, price pressure plays a major role here. This also applies in the case of subway/metro unit drives. Thanks to a very intensive two-year development project, which resulted in a significant design simplification and streamlining of production and testing of gearboxes, Wikov can regularly win interesting orders with a large annual volume and succeed in the competition. The product portfolio is basically divided into two large groups – one-stage gearboxes with axles and two-stage fully suspended gearboxes with a hollow shaft.

### Special Railway Vehicles

Drives for special rail vehicles and DMUs are the exclusive domain of our German company Gmeinder, which has many years of experience with them.

### Locomotives

Locomotive gearboxes are another domain in which Gmeinder specialises. These primarily involve shunting and freight locomotives, and take in the entire range of designs – from diesel through diesel-electric, to the axle-mounting of electric locomotives. Wikov supplements this portfolio with high-power gearboxes of partially suspended drives for passenger locomotives up to a speed of 200 km/h and power output of 1.4 MW.

## Absolute Independence of Gearbox Testing

As one of the few gearbox manufacturing companies in the world, Wikov is equipped with a gearbox test room, which enables the simulation of speed-torque characteristics of the driving cycle of rail vehicles. The new test equipment enables us to test the behaviour of gearboxes in conditions as close as possible to the real operating conditions of rail vehicles. The entire system is equipped with stepless control of engine torque and speed. This offers the chance to simulate vehicle driving characteristics such as start-up, as well as uphill and downhill driving or braking. By analysing recorded changes in speed, torque and/or temperature, the gearbox can be fine-tuned so as to be optimally ready for real-life operation. Gearboxes can be cooled by air flowing through special fans, mirroring the way in which air flows round the gearbox in the real-life vehicle environment. The entire system is protected by software against overload. Test results are immediately applied to the gearbox design – such as to adjustments by modifying the gearing, cooling the gearbox or further noise reduction. The system of hydraulic cylinders can simulate a dynamic load of up to 300 m/s<sup>2</sup>; it is equipped with two motors – driving and braking – with an output of 1.4 MW.

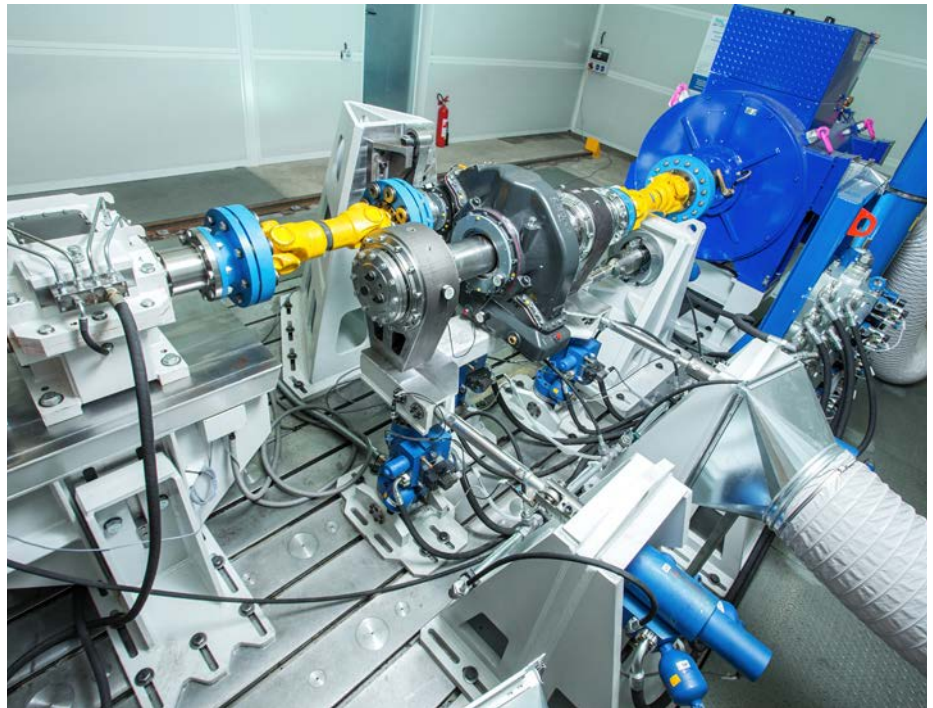
In addition, Wikov has gained valuable experience in testing drives for extremely cold conditions. Customers from Russia especially appreciate this kind of testing. Wikov uses a modular sandwich design for its cooling box, which can be assembled and disassembled easily. It is equipped with two 2 x 26 kW compressors with additional fans, thereby enabling the gearbox

or entire drive to be gradually cooled down to -45°C. For rolling stock gearboxes, the so-called hard start is used, when the gearbox starts up without preheating the oil. Such tests invariably involve measuring temperatures inside the gearbox, as well as pressure, torque, speed and vibrations.

## Conclusion

Current capacity for the manufacture and assembly of gearboxes in the Wikov group has

risen to more than 3,500 gearboxes per year. A further significant rise is expected for all types of rolling stock. Wikov also envisages expanding its trade network in key world territories by means of Gmeinder's extensive network. These days, Wikov is directing its development activities towards further increasing the utility features of the product portfolio, developing remote diagnostics and the use of artificial intelligence in processing large volumes of data from gearbox testing.



**Wikov MGI a.s.**

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☎ +420 491 488 420

🌐 [www.wikov.com](http://www.wikov.com)

Check out this short video to learn more about Wikov!



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CREATIVE INNOVATIONS...CONTINUING TRADITION



## Illuminating Rolling Stock

There is certainly no shortage of lightbulbs on and in a locomotive.

With multiple applications that require a luminary, whether it be headlights and ditch lights, cab-lighting within, or even safety switches, the sizes and options seem to be endless. And let's not forget the technology that continues to evolve. PowerRail, an AAR M-1003 Quality Certified

company, proudly offers a complete line of incandescent, halogen, and LED bulbs for all your lighting needs.

In 2020, PowerRail released an LED headlight solution for transit and light rail vehicles. The headlight, similar in design to the AAR-approved locomotive headlight, is currently being utilised at a major transit agency in the United States. It offers high and low-beam settings, and serves as a direct-fit

retrofit when upgrading existing halogen or incandescent lamps to LED.

In addition to this new light rail LED headlight, PowerRail is changing the face of lighting inside transit cars. PowerRail has converted the interior lighting of transit cars for multiple agencies across the U.S. Their T8 LED and T8 LED emergency backup tube lights are direct replacements for both T8 and T12 fluorescent lighting, providing

## 75V LED Corn Cob Bulb



## 30W LED Cab Ceiling Bulb



## 75V Work



an instant clip-in solution that gives operators ultra-long life and exceptional energy efficiency.

The T8 LED emergency backup tube is designed to replace all external backup power ballasts and drivers to keep the light functioning in the event that the main voltage is turned off. The light is ideally suited for use in open or enclosed luminaires where backup power is required in the event of an emergency or if the main power should shut off. In addition, the T8 LED light also incorporates test buttons to ensure the battery is operational for maintenance personnel or fire marshal

certification. The light can be suited to operate on various voltages and requires no external power supply or wiring.

For those times when repairs just can't wait, PowerRail also offers the 75V LED work light. Powered by the MU outlet on the locomotive car body, or an optional knife switch connector, these lights provide proper and safe lighting for your work crew when repairs are necessary in the field. Features include twin LED 18W lights with OEM-style light housings and a tiltable magnetic base with safety handle. Each set of lights also comes equipped with two 50' power cords

and safety locking connectors.

In addition, PowerRail also offers LED 50A19 75V Number Board "Corn Cob Style" bulbs and AAR S-5515 style Rough Service LED bulbs. With the latest Cree LED technology, these bulbs provide IP67 protection from water damage. Field tests with Class 1 railroads, regionals, passenger transit, and other applications have proven that these unique patent pending designs offer true reliability and performance. With a life rating of 50,000 hours vs. the 1,000 hours you typically have in a standard bulb, these bulbs also have an enhanced protective globe, eliminating the potential for

## 75V LED Ditch Lights



## 75V LED Rough Service Bulb



filament or glass break.

The most recent addition to PowerRail's line of lighting solutions is the FRA-approved LED headlight and ditch light for locomotives. With an advanced Cree 5th generation LED chip design, the 75V/40W LED headlight and ditch light meets AAR Standard S-5516 and is authorised by the FRA in compliance with 49 CFR § 229.125. This bulb provides 200,000 candelas for the complete life of the bulb, and has a life rating of over 50,000 hours. Unlike other headlights on the market, PowerRail's LED headlight has a proprietary circuit board design that is resistant to excessive shock

and vibration. The bulb operates on two settings, dim and bright, and is the only LED headlight to operate on ditch lamp – no flicker. Built with an idiosyncratic lens/reflector designed to melt ice and snow, and a patented heat sink design which provides optimal heat dissipation, allowing for peak efficiency, this bulb is designed to operate in extreme heat or cold, and also provides IP67 protection from water damage.

PowerRail is a United States-based company, with several locations in various parts of the world. Originally formed in 2003 in Wilke-Barre, Pa., the PowerRail Corporate

Offices and Main Distribution Center are now located on a 7+ acre site in Duryea, Pa. PowerRail proudly offers a wide range of new and rebuilt rail-related parts and components including bearings and journal boxes, electrical rotating parts, engine components, compressors, pumps, and motors, from their various manufacturing facilities across the US. In addition, PowerRail offers locomotive rebuilds, overhauls, and mobile maintenance at their locomotive shop. PowerRail is also a global supplier with locations in Europe and Australia.

[www.ePowerRail.com](http://www.ePowerRail.com)



YOUR RAILWAY PARTNER

## Connections: a key link in the railway transport chain

As an industry partner and **key supplier** in the international railway sector for more than 30 years, we have a clear insight into your challenges and expectations, such as service continuity, extreme weather conditions and mechanical stresses.

We provide an effective response with optimized solutions, whether for high-speed, main-line, suburban or regional trains, or tramways and underground railways.

[www.staubli.com](http://www.staubli.com)



Shock and vibration testing at Stäubli's Railway Competence Centre simulating different strains on three axes and testing during continuous operation and with shocks © Stäubli

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# Stäubli

## An Experienced Partner for Reliable Railway Connections

While the Covid-19 pandemic slowed mobility and even shut down many public services, the railroad did have had some difficult times with declining ridership. But this deceleration in the transport sector also allowed operators to tackle innovative project developments and infrastructure improvements.

It was not only railroad operators who were faced with this new slowed-down situation. Passengers also used the time to reflect on their travel and transportation behaviour. As reported by a survey last year, more than 50 percent of the interviewed Generation Z passengers said they were prepared to consider a more sustainable habit of transportation, with regular rail riders making up the majority. In parallel, the net-zero emission plans of many governments are pushing decarbonisation.

### Sustainability Speaks for Railroad

Although railways are the most sustainable form of transportation, there are still means to improve

decarbonisation in the rail industry by replacing diesel trains with electric trains using battery technology, hydrogen fuel cells, or overhead lines.

Traffic and transport behaviour on the large continents is quite diverse, and so the requirements for further development also differ. Many of the large European rolling stock manufacturers focus on implementing new energy concepts for their vehicles, improving control systems, increasing passenger safety and comfort and raising economic efficiency for operators.

Whenever safe and reliable power, data, signal or fluid connections are required to support the systems in these innovative railway projects, Stäubli Electrical Connectors is

a welcome technology partner. It's not only the vast portfolio of powerful, high-performing and most dependable connection components, it's also the broad experience in the industry and the many Stäubli experts worldwide that partner with railway engineers to develop the most suitable and most efficient connection solution.

### Resistant, Dependable and Adaptable Connections

Train companies are supposed to run around the clock in any climate conditions and on any terrain. The rolling stock is challenged on steep gradients, in tight curves, in icy temperatures, strong winds or in great heat. The Stäubli multi-pole rail connector for harsh environment

has proven its reliability and longevity without performance loss on the tracks of the **Swiss Rhaetian Railway in its alpine environment**.

Another alpine train operator will now rely on this solution for its passenger trains and particularly for its construction trains; however, the operator asked Stäubli to upgrade the connector with more performance contacts to adapt to the requirements of this specific application. This highly durable connector couples the power, data and signal transfer between the wagons and resists temperature variations of up to 60°C in one single ride. For this application a special housing with cover lid was designed, providing easy and safe handling for operation, but at the same time ensuring complete protection against snow and dust. To significantly reduce mechanical stress on the cable, a 15° departure angle has been designed. Prior to implementation, this multi-pole connector for harsh environments has been thoroughly validated in the Stäubli-owned test lab at the Railway Competence Centre in France.

## Tested and Proven Quality

Resistance to vibrations, mechanical shocks according IEC 61373 and even hammer strokes in case of icing are being tested for this application. The connector also needs to withstand mud, brake dust as well as wet conditions with dew and salt spray according IEC 60512-11, IEC 61984-11, EN 60068-2-11, ASTM B117.

The Stäubli Railway Competence Centre with its specific test laboratory has just successfully passed re-certification according to the latest IRIS (ISO/TS 22163) standard, defining the highest level of quality throughout the supply chain of products for the railway

industry. This certificate proves the suitability of Stäubli's quality management system and know-how for the requirements of the railway sector having aligned all activities in the company with a process-oriented approach.

## Customer-Specific Design

In other more remote regions, the available power grid via the overhead contact line is not strong enough or non-existent, so that additional power with battery systems is required. This entails adapted connection solutions in the electrical chain of traction. This situation is, among other challenges, part of the actual expansion and modernisation project of the regional transport line between Oslo and the Norwegian west coast. Stäubli has co-operated with the rolling stock manufacturer for this project, having grown the relationship over the years. Consequently, it has been able to implement the necessary adaptation to the **Modular Power Connector MPC**. This customer-specific design allows for a safe electrical connection between the individual functions of the inter-car connection in the new trains run by the Norwegian rail operator.

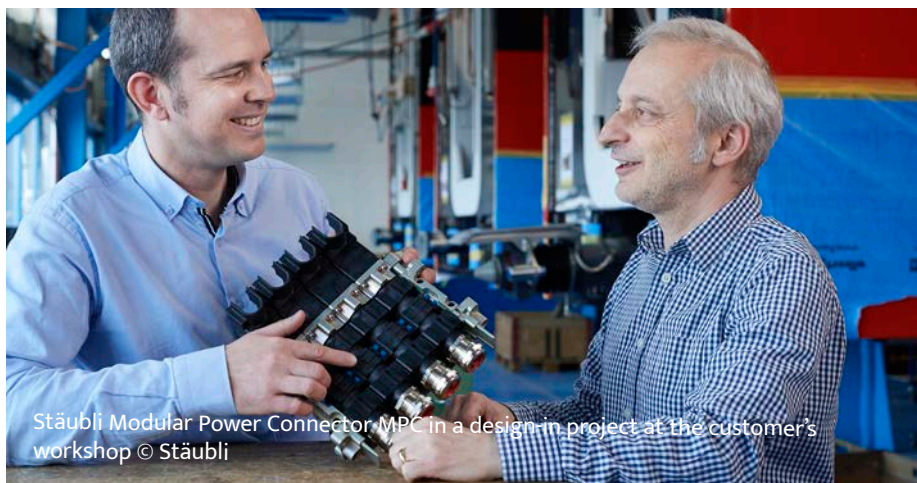
The Stäubli MPC owns a universal multi-application design composed

of standardised units to fit various installation requirements. In functionality, it provides durability and low-loss energy transmission for high currents, maximum shock, impact and vibration resistance and highest robustness – even in extreme climatic conditions. Quick separation during technical service helps to minimise downtime, paired with the very compact, space-saving design the MPC contributes to increasing process efficiency during installation and maintenance

## Reliable Experience

As a train operator safety, reliability, durability and economic efficiency are key criteria for customised solutions. That's where proven quality, based on extensive and reported test procedures and experience comes in. Stäubli has always placed a high value on the combination of exploring field data, test procedures by customer specifications and long-term in-house testing to guarantee quality and durability. This passion for quality and the track record of successful rail projects are the basis of Stäubli's industry experience, which distinguishes the technology specialist as an experienced project partner for innovative railway projects.

[www.staubli.com](http://www.staubli.com)



Stäubli Modular Power Connector MPC in a design-in project at the customer's workshop © Stäubli

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&lt; Rolling Stock

# Cummins

## Connectivity to Sustainability – The Future of the Rail Industry Looks Different

By Aytek Yuksel, Content Marketing Leader – Power Systems

Zephyr locomotives, named after the Greek god of wind, got everyone's attention in 1930s with their shining stainless-steel looks and high speed. They also re-invigorated interest in the rail industry and became the poster child of the industry for decades.

The next big transformation in the rail industry will have less to do with steel and more to do with silicon and different fuels. We will likely not see the looks of locomotives change dramatically, yet what is under the hood will make the difference. This article outlines three ways the rail industry's near future will be different.

### No. 1: Connectivity Will Amplify the Benefits of IoT, AI and Machine Learning

Connectivity is the backbone or the nervous system that brings together other technologies

including IoT, AI and machine learning. IoT objects can track different parameters; AI can instill the intelligence needed to make sense out of data collected, and machine learning can lead the execution of tasks; but connectivity brings these together and amplifies each one's contributions.

Meanwhile, 5G expands the capacity of connectivity and enables it to be more reliable with much lower latency.

For the rail industry, this means the number of IoT devices can be increased on locomotives without congesting the wavelengths. Higher reliability and lower latency mean mission-critical tasks requiring instant intervention and commonly not handled by machines, can now be handled through connected devices.

Locomotives are getting increasingly connected, and the emergence of 5G will further fuel



the use of connectivity within and beyond locomotives.

## No 2: A Set of Diverse Power Systems Will Give Rail Operators Fit-for-Market Solutions

In the 1800s, steam-powered locomotives were the sole option for rail operators. In the 1930s, diesel-powered locomotives started to gain traction and became the primary option. More recently, two technologies, diesel-electric and full-electric share most of the market when it comes to powering locomotives.

Meanwhile, there are emerging power system technologies trialed by the rail industry. These include fuel cells, both solid oxide and proton-exchange membrane, batteries and hybrid solutions.

Going forward, it is expected there will be a more diverse set of power system technologies used in the market, instead of one or two technologies dominating others. Rail operators are expected to pick and choose the right power system

technology based on infrastructure availability, local regulations, economic feasibility and customer preferences.

This will result in currently leading technologies, diesel-electric and full-electric, to co-exist with emerging technologies, such as fuel cells and batteries, often through hybrid applications.

## No. 3: Decreasing Emissions Will Lay the Path towards the All-Renewable Future

For many sectors where energy is used, it is commonly agreed the final destination is an all-renewable future. Meanwhile, the pace towards the destination varies significantly. For example, about 30% of the electricity we use today is from renewables, and it is forecast that after 2040 we will be getting more of our electricity from renewables than fossil fuels.


Mix of technologies from electronics and controls to aftertreatment systems are used in the race towards near-zero NOx engine emissions.

A key focus during our journey towards an all-renewable future is lowering the emissions of leading power system technologies. For instance, emissions of nitrous oxides and particulate matter of diesel engines have decreased over 80% over the last two decades. Technologies such as selective catalytic reduction (SCR) and exhaust gas recirculation (EGR) enabled this significantly reduced environmental footprint.

Going forward, decreasing emissions will continue to be a focal point. In the near term, diesel-hybrid and fuel cell applications will take the lead on lowering emissions. For example, during the second quarter of 2020, two trains powered by Cummins Inc. fuel cells completed an 18-month trial in Europe with over 180,000 km traveled. By 2022, there will be 41 of these types of trains powered by Cummins fuel cells running in Europe, making Cummins the leading provider of fuel cells for trains globally.

The rail industry has gone through its own share of changes over the last few decades, but the current decade is likely going to be a transformative one. Rail professionals' minds are occupied by topics ranging from technology choices to talent gaps; meanwhile the industry is embracing a diverse set of power solutions and speeding up the connectivity journey.



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- Best Solutions for Crew Accommodation – Comfortable, Cost Saving, Personalised

# eCon Engineering

## Digital Technologies Move the Railway Industry Forward



**T**he global railway industry is experiencing incredible growth.

Statista estimates that the European railway market will grow from 16 billion USD (13 billion euros | 11.4 billion GBP) in 2020 to nearly 29 billion USD (24 billion euros | 20.6 billion GBP) by 2025 — an annual growth rate of 12%. Railway engineering teams face the difficult task of balancing growth and product innovation

with an unswerving commitment to passenger safety.

As consumers look for environmentally responsible transportation alternatives, rail tracks are becoming more densely populated with traffic. For trains to make gains in speed and energy performance, rail manufacturers must ensure their designs operate with an incredible degree of precision.

At the same time, railway engineers

are also challenged to capitalise on the new opportunities created by digitalisation, autonomy and cross-border standardisation that will open longer routes.

Virtually every rail manufacturer today is racing to market with revolutionary new solutions in key areas to support the growth of the railway industry by optimising control and maximising safety, even as traffic increases. Let's look at some of the key technology growth areas.

## Automatic Communications-Based Train Control (CBTC) and Protection Systems

Increasingly, railway control and protection systems feature some level of autonomy — including fully driverless operation. Because CBTC systems use real-time data to manage traffic and infrastructure capacity, they are critical to supporting industry growth and increased density on the tracks.

Automatic train protection (ATP) and automatic train operation (ATO) technologies monitor the train's position and speed in real time, autonomously activating emergency braking and other functions as needed to ensure safe operation, and to maintain schedules and timetables.

## Driver-Machine Interfaces

As trains become more digital in nature, featuring autonomous functionality and a wealth of embedded software, new interfaces and displays are needed to provide real-time data to human operators. Intelligent interfaces can simulate expected track or train conditions, then help drivers choose the best course of action.

## Interlocking Solutions

The railway industry has long relied on interlocking systems to keep stations and platforms safe by signalling to individual trains as they approach and leave. Today's interlocking solutions are more sophisticated and automated in nature, connecting multiple

trains with the overall railway environment to avoid collisions and other unexpected events.

As rail traffic grows, interlocking systems are a core capability for managing complex traffic patterns. Wireless communication and data-processing capabilities help interlocking systems monitor and control safety conditions in real time.

## Mechatronic Control Systems

Today's trains rely heavily on electronics and software — but equally important are the mechanical systems that enable functions like traction and braking. Mechatronic control systems bring these two capabilities together, allowing the digital management and activation of the train's essential mechanical systems, often autonomously. This requires continuous monitoring, connectivity among multiple systems and data-based decision making.

## Overcoming the Embedded Software Challenge

Underlying each one of these technological capabilities are millions of lines of embedded software code that manage, monitor and control their functionality, as well as their interaction with other electronics both inside and outside the train.

Because of the high level of risk associated with train controls and the digital complexity of modern trains, embedded software design and validation represent one of the more time-consuming and



expensive activities in railway product development.

eCon Engineering deals 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.

To help railway engineers meet embedded software challenges, Ansys SCADE solutions provide a model-based environment for defining embedded software architectures and behaviour, verifying functional performance and automatically generating the code that executes that functionality, flawlessly.

The eCon Engineering Kit, complete with simulation software solutions from Ansys, enables rail manufacturers to balance uncompromising safety with the short development times and low engineering costs required to launch innovations and secure a competitive edge.

source: *Ansys.com*  
(Author: Krista Loeffler - Senior Product Marketing Specialist, Ansys)

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

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# Best Solutions for Crew Accommodation – Comfortable, Cost Saving, Personalised

**24 HOURS  
A DAY**

**7 DAYS  
A WEEK**

**365 DAYS  
A YEAR**

## Ideas, Tools and Solutions for Crew Management

Xenia is a global provider with 30 years' specialisation in crew services management. We support the rail companies with their hotel and transfer needs, planned or last minute, both for staff and customers.

Immediate response is ensured by innovative technology and 24/7 customer support that is available throughout the entire year.

The service includes worldwide hotel scouting, negotiation and drafting of contracts and operational management, resulting in a full client support.

The key points of the services are:

- worldwide accommodation selection and inspections
- bespoke directories, with hotel chains and individual properties
- personalised rates and pricing models
- benchmark data and expense management dashboard and solutions
- innovative reporting tools

- a technology system which can interface any third-party platform
- prompt and effective responses to any request – from urgent enquires to long terms contracts – worldwide
- a great capacity to block large banks of rooms for scheduled crews and individual bookings for crew members, business travel, distressed crews and delayed passengers handling

## The Value of Partnership

Rail companies, airlines, airports, operating companies and carriers can all benefit from Xenia's consolidated experience in the hotel and service accommodation field. The collaboration allows advantages in terms of economies of scale, purchasing expertise, market insight, data collection and market intelligence – on top of which a customer-oriented team ensures the clients always receive the maximum value.

The expertise and the know-how in hôtellerie, as well as the service system based on CRM, allow Xenia to support businesses at maximum levels of personalisation. Bespoke solutions can be provided to every customer – i.e. integrating and managing their information on IT systems in real time.

Xenia's operating model ensures the full application of the most favourable conditions and a context-sensitive benchmarking analysis which identifies areas of intervention in the economic and qualitative senses.

## The Hotel Programme

The **Hotel Programme** is the outcome of a specific negotiation activity that takes account of the rail company's expectations in terms of budget, standard, location, services, payment, travel policies, regulations, etc.

The significant expertise in hotel management finds expression in a range of high-value-added high-tech targeted solutions and models:

- bespoke accommodation directory
- management of hotel and other supplier deals. All facilities meet specific location, safety, comfort, price, quality, cultural and service requirements in accordance with company policy
- transfer management
- review of existing supply
- daily checks and negotiations to ensure the best rates are applied
- data benchmarking against existing accommodation supply
- effective management of booking procedures
- room inventory for distressed passenger/crew members
- centralised payment management
- delivery and management of reports and market intelligence
- reporting for enquires coming from the trade union
- site inspections
- assurance of compliance of best safety and comfort through
- authorised access levels
- web-based room inventory management and booking system
- room blocks and hotels conditions specifically preloaded for each company
- personalised vouchers/booking forms for the hotels
- access to real-time inventory via a proprietary web portal integrated with the company's system
- travellers' access to bookings via a mobile-enabled website
- proactive daily room blocks
- dedicated Account Manager and Hotel Programme Manager
- emergency response plan development
- 24/7/365 Customer Service Center

"Accommodation Secure Protocol"

## XENIA CrewIn

Xenia offers suite crew tech solutions which makes it possible to optimise the way a company manages its own inventory, commercial strategy and reporting/analysis.

These solutions are high-tech, easy to use and specifically tailored for every customer. The solutions are also preconfigured with all contracted conditions, including corporate travel policies, budget and procurement allowances and other relevant authorizations and negotiated conditions. With:

- rate negotiation
- hotel contracting
- full reporting capabilities
- customised invoicing and reconciliation tool
- accounting and auditing services

## Business Intelligence

Xenia is strongly committed in providing IT infrastructure that is entirely developed in-house for the successful management and organisation of the hotel service including reporting and integration with third parties. The attention reserved to research innovation results in high-value-added products and services of business intelligence.

Such tools include:

- benchmark and expense management systems
- rostering analysis to optimise crew management
- an interface that allows third-parties to be integrated
- advanced reporting, consumptive/predictive data analysis – for an integrated

management of the travel industry's processes and a thorough monitoring of the sector dynamics

- HotelRating® – Xenia's operating model with alphanumeric rating values deriving from continuous inspection activities, as own intervention or in co-sourcing with the corporate clients
- Georeferencing System® – for searches starting from a point of interest (POI) or a generic address, with the development of a detailed itinerary and the display of partner hotels and the relevant room availability for direct reservation requests

- Occupancy Way® – a proprietary system for the monitoring of the occupancy level of the hotel programme facilities
- XeniaCrew – a web tool that can interface with clients' systems to support and monitor crew accommodation services through customisable functions. The application is able to get any data of interest regarding the stay or the facility, in order to return them to the customer
- green lodging policies – an environmentally friendly profiling of the hotel facilities, for an additional distinctive character to the hotel programmes



## About Us

Xenia S.p.A. was founded in 1992 and has always operated in the business travel market. In 2021 it transitioned into a Benefit Corporation. Xenia is a global provider specialised in managing the entire crew accommodation process and the layover and AOG services as a support to the airlines, railways, shipping lines and cargo company.

Xenia is acknowledged for its expertise, its flexible and creative approach, the continuous investments in research and innovation – all leading to the highest level quality standards and to offer integrated and cutting-edge solutions.

**Xenia S.p.A. SB | [www.xeniahs.com](http://www.xeniahs.com)**

# Infrastructure

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# LANKELMA

## RAIL SITE INVESTIGATION

### CONE PENETRATION TESTING (CPT) GEOTECHNICAL INSTALLATIONS

#### Specialist site investigation for earthwork and track design.

With dedicated road-rail CPT trucks, an RRV mounted CPT unit, and specialist CPT units, we can undertake investigations in all areas of the trackway.

We offer high production and cost-effective investigations, providing quality results in real-time.

Over 15 years in  
the rail industry

Highly experienced  
field operatives

Rapid  
mobilisation



# Complete Composite Systems (CCS)



**ARCOSYSTEM® is a lightweight and versatile elevated cable management system. Designed to be post-mounted, wall-hung or fixed to lineside structures at 6-metre centres, its dedicated range of bracketry enables height and direction changes to be safely accommodated with ease.**

Demands on any railway trackside system are wide and exacting, which is why the ARCOSYSTEM® — as well as being flexible — is constructed from the most durable materials. Pultruded troughs and lids, supported by laser-cut steel bracketry, provide a consistent, reproducible, long-lasting system capable of withstanding the most extreme conditions.

Developed by Swiss company **Castioni Kabelführungssysteme GmbH**, and exclusively distributed in the UK by **Complete Composite Systems**, the ARCOSYSTEM®'s support structure and bracketry are made from galvanised steel, a robust material with predictable structural performance. By coupling it with the twin-walled design of the cable trough, ARCOSYSTEM® is able

to resist lateral forces from the likes of embankment subsidence, high snow loads and wind effects from high-speed trains.

The ARCOSYSTEM®'s cable trough and lid are made from pultruded fibre-reinforced polymers, which excel in structural and load-bearing performance as well as heat, weather, corrosion and UV resistance compared to more common materials. With performance across a wide temperature range and resistance to fire and corrosive attack from an array of chemicals, ARCOSYSTEM® excels in remote locations subject to intense heat or extreme freeze-thaw cycles.



## Any Size for Any Job

ARCOSYSTEM® has recently expanded its choice of products to cater for a wider range of challenging rail installation projects.

Originally available in Size 1 and Size 2, there are now a Size 0 and a Size 2+ available.

Size 2+ has deeper and more robust side walls, designed to withstand higher lateral loads than Size 2, enabling the system to withstand the pressure from snow ploughs clearing snow drifts. The deeper design also allows for multiple cable jointing where necessary.

Size 0 has been introduced to

house data cables in a separate, shallower troughing, a facility which is seeing higher demand from contractors across the world as the digitalisation of railways continues apace.

## Saving Time and Money

Our **innovative new technique** of part-mechanised ramming means ARCOSYSTEM® is even quicker and more cost-effective to install.

The process, developed by Aarsleff, our engineering partners in Denmark, allows the steel posts to be inserted into the ground at the required depth swiftly and accurately with the help of specially-built machinery, removing the need to hand-dig a hole each time.

With ARCOSYSTEM® already regarded as a system that's fast and lightweight to install compared with concrete ground-based alternatives, this cutting-edge ramming technique has sped that process up even further — ensuring installation times and labour costs are dramatically reduced.



## ARCOSYSTEM® — key features:

- Spans 6 metres between supports
- Carries cable loads up to 90 kg/m
- Withstands point loads up to 0.75kN and wind loads up to 1.45 kN/m
- Electrically insulating; breakdown voltage almost 50 kV
- Constant working temperature range -40°C to +80°C
- Withstands continuous freeze-thaw cycles
- Meets a number of fire standards and proven performance in simulated trackside fires
- Resistant to water and a wide range of chemicals
- Lightweight, robust, long-lasting and easy to install
- Fast and cost-effective installation

## The Eco-Friendly Post Mix Choice

When installing posts for ARCOSYSTEM® or fencing projects, TECHNO-CRETE® is the environmentally friendly post mix choice.

It is a two-part, high-density hydrophobic polyurethane based on a blend of reprocessed oil from the catering industry and sustainably grown rapeseed oil. Once mixed, the blend foams to form a structurally robust, solid foam that securely holds fence posts, elevated troughing and signage in place. Supplied in easy-to-handle 1.8kg packs, TECHNO-CRETE®'s two-

pack system is hand mixed. It doesn't need water, and a 1.8kg pack replaces three 20kg bags of concrete post mix. It therefore significantly reduces transportation costs and the risk of personal injury from manual handling.

When using TECHNO-CRETE® instead of cement-based concrete in 1,000 holes, 300 x 600mm diameter, over 10 tonnes of CO2 emissions are saved from entering the atmosphere, the equivalent of over ten return flights from London to New York.

## Non-Conductive Fencing

TouchSafe® FRP Composite Palisade Fencing is made to offer a strong, safe and non-conductive barrier to screen electrical equipment or hazards.

The panels are manufactured from pultruded profiles and cross angles that are interlocked to form a robust structure.

There is no need for maintenance and less chance of damage from potential vandalism incidents, with pales passing through the rails to reduce the risk of prising apart. As composites are natural electrical insulants, the fencing provides a non-conductive boundary for the safe containment of electrical



equipment on rail applications such as substations, LOC suites, and OLE masts.

Delivered in full panels to reduce installation time, all fixings are comprised of GRP so earthing is not required. The fencing is also lightweight and corrosion-resistant against most oils, acids and alkaline chemicals. TouchSafe® is produced with UV inhibitors within the resin and finished with a UV-resistant synthetic polyester veil that encapsulates the profiles to add further protection against the elements.

Discover more about ARCOSYSTEM®, TECHNO-CRETE® and TouchSafe® Fencing by visiting our UK stockist, **Scott Parnell**, at Rail Live 2021 at **Stands E7 and E9**





There's a saying that "things get better with age" and we like to think exactly that about our business in Manchester. We've been making cables here in Blackley since 1895 and during the last 126 years we've grown to become the largest specialist cable manufacturer in the UK. Our vast range of cables are specified by electrical professionals for applications in Telecommunications, Building Management Systems, Data Networks, Railway Infrastructure, Fire Prevention and Security Systems. And now, thousands of electrical contractors can also benefit from a range of high

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# GOLDSCHMIDT

Smart Rail Solutions



## SAFETY IS MEASURABLE

**Measuring & testing solutions from Goldschmidt:  
smart inspection for enhanced safety and quality of your rails**

A detailed diagnosis of the track condition is the basis for predictive maintenance, which guarantees the long-term economy and reliability of your track infrastructure. Measuring and testing technology on inspection trains, trolleys and hand-held devices from Goldschmidt enables you to carry out detailed evaluations to identify deviations and take preventive maintenance measures.

# Goldschmidt

## Reliable, Safe and Efficient Infrastructure through Innovative Testing Technology for Automated Rail Testing

In order to ensure rail traffic safety, it is vital to have precise knowledge of the condition of the track infrastructure. The subgrade, superstructure, switches, rails and overhead line form an overall complex in which individual components influence each other.

The inspection and analysis of the condition of rails is a prerequisite for condition-based and preventive rail maintenance – which in turn is a prerequisite for the sustainable reduction of lifecycle costs of railroad infrastructure components.

Against this backdrop, two innovative Goldschmidt Group companies, PLR from Germany

and GRAW from Poland, have set out to make the inspection of rails for various types of damage safer and the reporting of results more reliable by combining their respective products. While the focus in the past was more on detecting rail defects caused by production, today it is more on operational defects due to higher axle loads and speeds. This was taken into account at an early stage in the further development of the testing systems.

### Requirements for the Inspection of Rails for Near-Surface Defects

Many European railroad infrastructure companies have developed internal guidelines for testing rails for near-surface defects, co-ordinated them with their supervisory authorities and put them into force.

A European standard for the eddy current testing of rails, DIN EN 19729-2, was published for the first time in 2020. It describes how eddy current testing is used to detect and classify surface cracks in rails – mainly caused by rolling contact fatigue. The main focus is on – but not limited to – head check and squat defects.

Head checks (UIC 2223) are cracks open towards the rail surface with a high frequency per metre, which are mainly found at the running edges of outer rail curves. Depending on the local conditions, rail quality and profile, the parallel cracks are located at a distance of approx. 1 mm to several centimetres from each other, spreading at an approximate angle of 25° into the interior of the rail head and then often continuing parallel to the running surface or tilting downward. The periodically occurring head checks combine to

produce material breakouts on the running edge of the rail or multiple fractures of the rail over several metres. Head checks in an advanced stage can thus be classified as particularly dangerous rail defects. Squats are cracks that spread inside the rail head. In the early stage, the crack grows at a shallow angle to the rail surface, to a crack depth of approx. 4 mm. The crack grows downward and transversely in the rail head and is thus frequently the cause of broken rails. Since squats (UIC 227) can also occur in close succession, there is a particularly high risk of a rail section comprising several squats breaking away, which can lead to derailments.

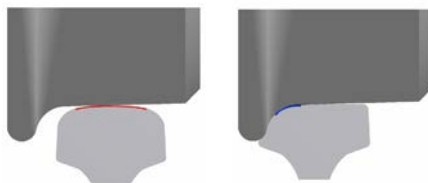
Eddy current inspection of rails is always closely connected with simultaneous visual inspection. For a comprehensive assessment of rail damage and the search for its cause, it is essential to look at the track system including ties, fasteners, etc.

Qualified and certified personnel in accordance with DIN EN ISO 9712:2012 and EN 16729-4:2019 are necessary for carrying out the inspection activities on rails. In Germany, for example, these personnel are trained at the German Society for Non-Destructive Testing (DGZFP).

In recent years, the demands on inspection systems have increased due to changes in damage patterns. Available track possessions have been reduced to a few hours per day to carry out inspection and maintenance work on the track. Automated, non-disruptive inspection of the rails during regular traffic is thus becoming unavoidable. Limited maintenance budgets require software-based solutions for the efficient evaluation of the recorded condition data.

## Goldschmidt Eddy Current and Video Inspection Test Systems

### Eddy Current Test System

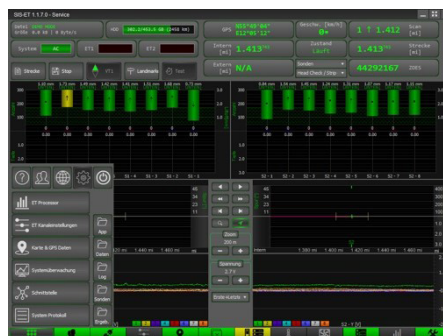


Running surface      Running edge

Near-surface rail defects can be very accurately detected and evaluated with the SIS ET HS 88 system at test speeds of up to 80 km/h, with up to 8 probes per rail in a range from  $-45^\circ$  on the running edge to  $+10^\circ$  on the running surface.

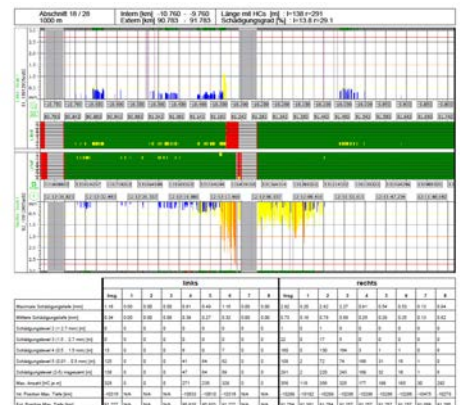
Intuitive user guidance, precise localisation and software-based algorithms make it possible to quickly generate an inspection report with just a few clicks. The report is easy to read and can be imported into other customer systems as an export file. Among other things, the inspection report provides information on crack lengths, damage depths and crack frequency in the damage areas. The data is used to evaluate the actual condition and to initiate rail maintenance measures.

### Rail inspection monitoring screen



This provides our customers with the information they need to know which rail machining process is the most economically viable solution for each use case in order to restore the rail to a flawless condition. Regular inspections make it possible to detect incipient cracks at an early stage and eliminate them before they start to grow exponentially. The result data of the SIS ET HS 88 system are an essential control instrument in the process of optimising and extending rail service life.

### Inspection Report



The eddy current testing systems are successfully used in many countries by infrastructure companies, measurement and testing service providers, as well as for rail machining service providers. They are successfully used on grinding and milling vehicles for monitoring the quality of the work.

### Video Inspection System

Our video inspection system recordings provide you with more comprehensive insights into the condition of the superstructure by means of continuous image recording. The video inspection system consists of line-scan cameras and powerful LED spotlights, which enable image registration in almost the same lighting conditions during the day

or at night, and at high speeds. The data are automatically analysed based on defined characteristics – using software support and integrated image processing algorithms. If irregularities are detected, e.g. cracked ties, rail fastenings or insulating joints, as pictured here, the images are registered with the corresponding location information, e.g. track ID, GPS position. These can be exported in any format.

#### Video inspection



### Strong Together

Through the combined use of eddy current and video inspection systems, images of the respective damaged rail section can provide further clarification on the causes for each irregularity detected by the eddy current. Rail defects which were detected previously and already secured do not need to be revisited.

In addition to saving costs, the reduction of the number of employees on the track is another advantage. This makes walking along the track to detect loose or missing fasteners unnecessary – while at the same time increasing occupational safety for our customers' employees.

Shown in the picture, the eddy current inspection technology

has detected a squat defect in the left rail and entered it into the inspection report. The video inspection system has confirmed this squat in its image recording. This rail defect has thus been confirmed by both systems and the inspection statement is redundant and very reliable.

### Data Management and Analysis

During the measurement run of the train, position data, such as D-GPS, are stored together with the inspection data, and result files with the detected defects are created. All data from the measurement run can be transferred online to the customer's data processing centre, where the data can then be analysed and the configuration of the recordings saved.

The correct localisation of the test data is also of utmost importance when it comes to comparing current test data with historical data. Automatically detectable infrastructure incidents can be added to the test data during

registration in order to ensure correct positioning.

### Summary

The Goldschmidt Group offers its customers measurement and testing systems customised to fit their needs for the detection of rail defects and both, track and rail geometry deviation as part of automated inspection. The combination of eddy current testing results and video inspection enables our customers to notably optimize maintenance work. This significantly helps to increase the availability of the network and to make efficient use of maintenance budgets.

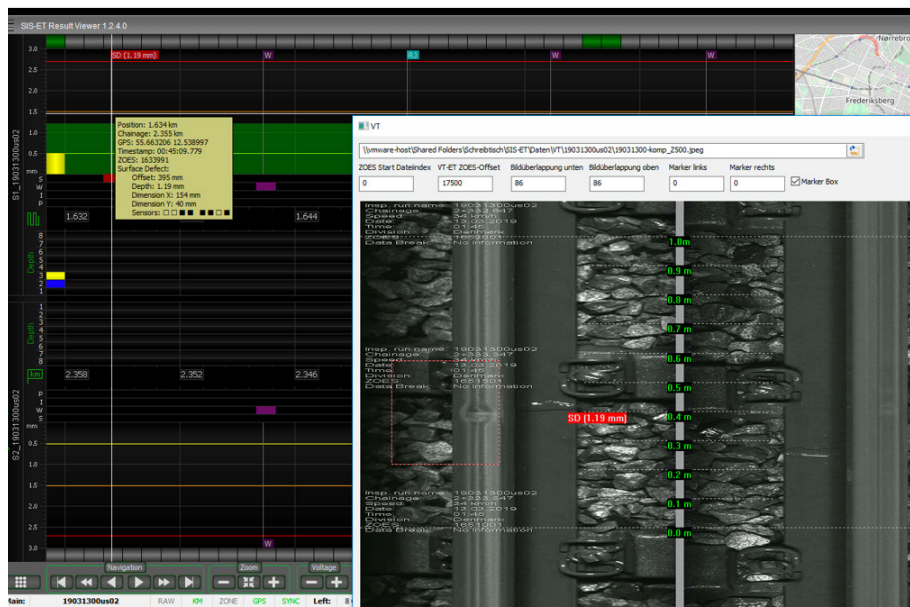
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**GOLDSCHMIDT**

Smart Rail Solutions

#### Eddy current test report with image recording for detected squat



# Autonomous Track Inspection

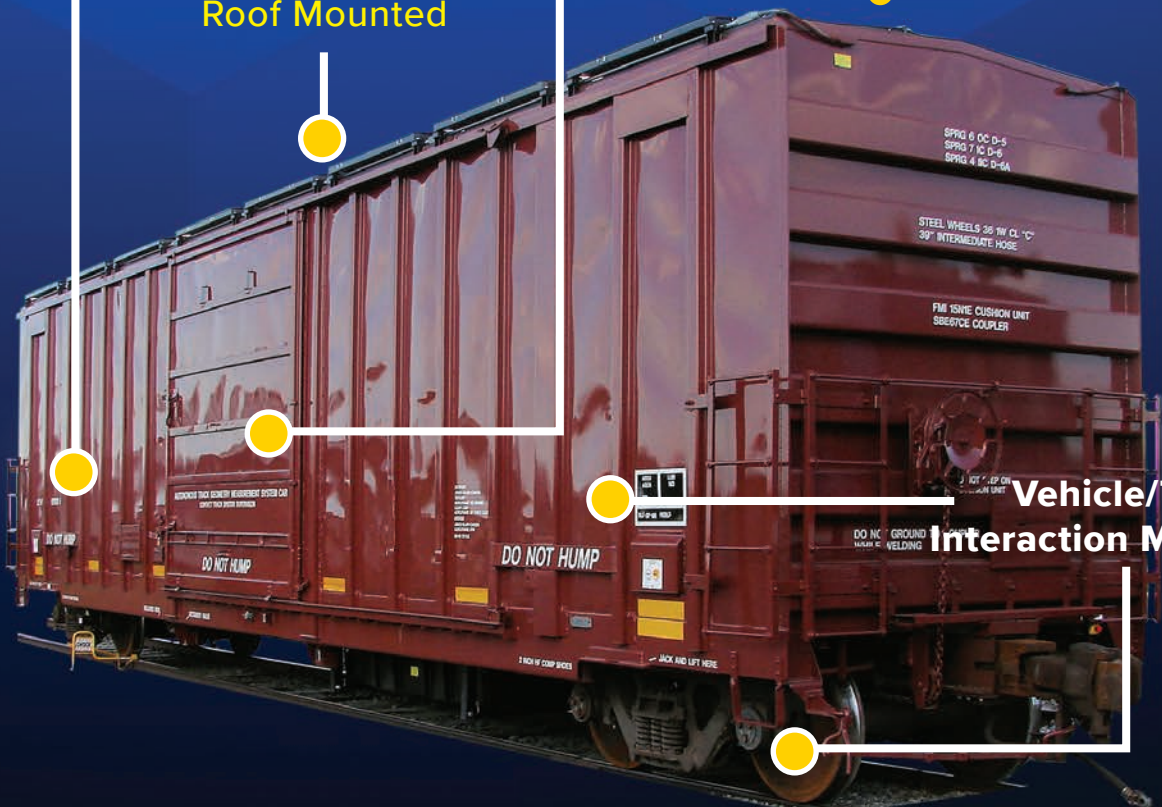
Decreased derailment risk.  
Increased efficiency.  
Lower costs.

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Joint Bar  
Rail Surface  
Carbody Mounted

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Reserve Power

Continuous Data  
Streaming  
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Roof Mounted



Vehicle/Track  
Interaction Monitoring

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

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 **ENSICO**  
Rail

# ENSCO Rail

## Autonomous Track Inspection: Keeping Railways Moving Safely and Efficiently

The railway industry is entering a new era of autonomous track inspection that couples frequent inspections of track with defect detection and software analysis capabilities, which in turn 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.

ENSCO Rail autonomous track inspection platforms now provide a full range of capabilities to the industry to evaluate track geometry, rail wear, vehicle-track interaction, and machine vision inspection of the track and its components. These platforms utilise precision location-determination hardware coupled with advanced linear referencing algorithms to assign track locations

and apply appropriate location-based defect threshold limits. The technology employs unique data compression algorithms to stream large amounts of information to the cloud in near real-time for short and long-term maintenance planning.

### More Reliable Detection through Artificial Intelligence

One inherent challenge faced by autonomous track measurement systems is that certain conditions or track features can mimic defects,

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



AUTONOMOUS VEHICLE/TRACK INTERACTION MONITOR C

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 Offers 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 specified maintenance strategy. Asset management plans include rail grinding, rail replacement, ballast renewal, tamping and turnout maintenance requirements.

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



# LANKELMA

## Rail Ground Investigation



**E**stablished in 1999, Lankelma has grown to become a world leader in specialist Cone Penetration Test (CPT) site investigations.

Their qualified, highly experienced field operatives and an extensive fleet of CPT equipment can be mobilised anywhere in the UK at short notice. With over 15 years of experience working in the rail industry, Lankelma can perform ground investigations in all areas of the trackway.

CPT is a technique for soil testing that is ideal for rail investigations because it is quiet, produces minimal disturbance and spoil, and can achieve deeper penetration (depending on the geology). Time is critical when working in a rail possession and CPT offers fast assessment of soil conditions under the track with a high degree of accuracy and repeatability. A CPT is performed by pushing an instrumented cone into the ground at a constant rate, with measurements recorded every 20mm.

CPT investigations characterise subsurface materials in situ, produce continuous profiles, and determine soil parameters including soil type, in situ stress conditions and shear strength for use in geotechnical design. High-quality results are available in real-time which allows engineers to take decisions on site during the ground investigation. This is particularly useful when identifying the best locations for further investigation, especially as detection of potential problems is of paramount importance on the railway.

As the use of CPT in railway investigations has grown, Lankelma has developed specialist rail CPT plant and equipment specifically designed for ground investigations in the four main rail environments: track bed, embankments, tunnels and stations. These rail CPT plant can be used with the full range of standard and specialist cones and be used to install instrumentation. Provided there is sufficient reaction force and a power supply, CPTs can be carried out almost anywhere.

## CPT Units

One of the biggest innovations in rail CPT site investigation in recent years has been Lankelma's one-of-a-kind road-rail CPT truck – the world's first dedicated rail CPT truck. It arrives by road and accesses the track from level crossings or authorised road-rail access points (RRAP) using the central turntable mechanism and rail wheels. This capability of the self-contained

truck allows rapid mobilisation and transports the operatives along with all testing equipment between positions, meaning multiple CPTs in the four-foot can be carried out in a short period of time. The rail CPT truck has significantly improved productivity in rail site investigation.

For ground investigations on other areas of the trackway, Lankelma's rail excavator-mounted CPT unit may be the answer. The CPT unit attaches to the arm of an RRV excavator; the excavator then manoeuvres the self-contained unit to each test position. Testing can be carried out in the cess, six-foot, ten-foot, up and down embankments and cuttings.

Site investigations in challenging environments like tunnels and stations are also possible. Lankelma has developed lightweight, hand-mobilised CPT rams suitable for testing positions with access restrictions. These rams are bolted

into position to gain reaction and can test in multiple orientations. The same equipment, which is electrically powered, and therefore quiet, is suitable for testing within open stations, tunnels or on platforms.

## Projects

Lankelma have been involved in rail investigations for electrification schemes, emergency slips/faults on track, track upgrades and embankment stability work. The rail CPT truck helped gather high-quality ground information for the reconstruction of a failed section of railway embankment at Wrecclesham, Surrey. Network Rail discovered that a 250-metre section of the embankment had failed, causing the track to settle. Emergency stabilisation works allowed safe reopening of the line and work began to find a permanent solution. Lankelma carried out ten CPTs over a single shift along the failed section. Tests were carried out in the four-foot, through one-metre-thick ballast and into the sand and clay below, to a maximum depth of eleven metres. This information was used to help characterise the embankment material and the geology beneath.

Ground investigations to support Network Rail's South Wales Re-Signalling project involved working over a series of seven-hour Saturday night shift possessions. Lankelma's rail CPT truck was ideal, able to travel quickly and carry out multiple CPTs along the 35 track-mile length of the scheme during the short possessions, covering new signals, location cases and functional supply points.

Following the identification of embankment instability on several rail assets in Hampshire and Somerset, Lankelma responded to





the needs of an urgent requirement for geotechnical definition by delivering preliminary soil stratification, pore pressure and geotechnical parameter derivations within one week of completion. The rail CPT truck and excavator-mounted CPT unit carried out investigations at three sites over ten twelve-hour shifts. As part of a scheme to improve London's transport network, Lankelma was procured to carry out CPTs at Finsbury Park tube station. Using a lightweight mobile CPT unit anchored to the walls of the station's stairwell, horizontal testing was performed. Four horizontal CPTs were pushed 14 metres into the wall to provide an assessment of the current structural arrangement.

## Rail Ground Investigations

A rail track facility at Lankelma's

head office facilitates development of its rail-specific CPT units and maintenance of equipment. In-house mechanics ensure all rail plant is compliant with standards so they can offer a first-class service to clients.

Lankelma are RISQ-accredited, trading as a specialist 'plant hire'

company under Network Rail's Plant Operator Scheme (POS), and all on-track rail plant are VAB approved.

Lankelma has recently expanded their rail capabilities with a second track-mounted CPT unit. The latest addition is cutting-edge technology and will assist to speed up rail investigations.



### Contact Us

to discuss your rail site investigation



[info@lankelma.com](mailto:info@lankelma.com)



+44 (0)1797 280 050



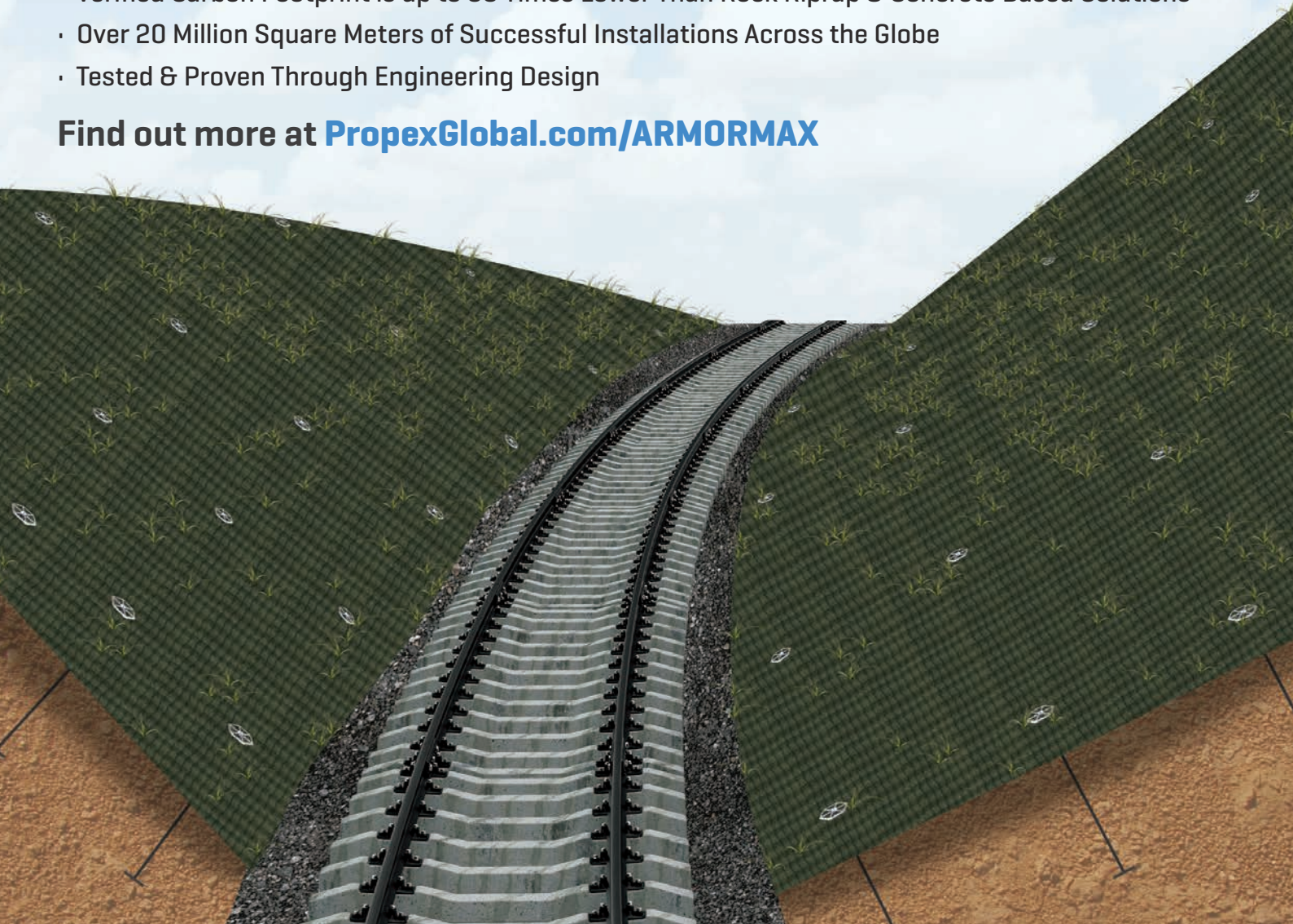
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# Propex Global

## Replacing Gabion Baskets with ARMORMAX for Slope Stabilisation



The Metal Museum in Memphis, Tennessee is dedicated to metalsmith artwork. Its campus is located on a 3.2-acre site overlooking the Mississippi River and houses several historical buildings, a blacksmith shop, foundry, restoration lab, library, and sculpture garden. A slope located behind one of the buildings was experiencing sliding and slope instability. The slope had previously been reinforced with gabion

baskets, but the solution was failing and the slope was continuing to slide. The City of Memphis needed to find a new, long-term solution to stabilised the slope.

Steepened slopes often require stabilisation and protection from surface erosion. The incorporation of an Engineered Earth Armoring Solution™ can assist in remediating geotechnical slope failure by passively resisting soil movement.

The ARMORMAX® system was selected to replace the failing gabions. ARMORMAX is a solution for surficial slope stabilisation that provides vegetated reinforcement, improves the factor of safety, and significantly reduces the probability of failure. The system is composed of Engineered Earth Anchors that are designed and tested for compatibility and performance with High-Performance Turf Reinforcement Mat (HPTRM) to

increase slope stability for up to 75 years.

Approximately 2,500 square metres of ARMORMAX was installed along the slope. Due to the grade of the slope, 1.8m type B2 anchors were used on the project. The anchors are corrosion resistant and designed to provide resistance to shear and lateral forces.

After installation, the HPTRM was hydroseeded with a bonded fibre matrix (BFM) and seed mixture to accelerate vegetation. ARMORMAX is engineered to establish vegetated reinforcement. The system features a patented trilobal design that locks seeds and soil in place to promote rapid root development for long-term vegetation. This helps to decrease sedimentation and pollutants and encourages infiltration of water back into the groundwater table. These are two reasons why the Environmental Protection Agency (EPA) has identified systems that

utilise HPTRMs like ARMORMAX as a best management practice (BMP) for improving water quality. Alternative hard armouring solutions like gabion baskets do not promote vegetation and offer poor filtering and pollutant removal capabilities.

ARMORMAX also has a lower carbon footprint than hard armouring solutions. One square metre of its HPTRM has a cradle-to-grave carbon footprint of 2.7 kgCO<sub>2</sub>e. Comparatively, the carbon footprint of concrete-based alternatives is up to 10 times higher, and rock riprap is up to 30 times higher. The carbon footprint of the HPTRM is verified by an independent third party, which certified that it meets criteria for The Greenhouse Gas Protocol (World Resource Institute), PAS 2050:2011, and ISO 14064-3:2006.

Transportation requirements are a main factor contributing to the difference in carbon footprint. Projects that utilise ARMORMAX

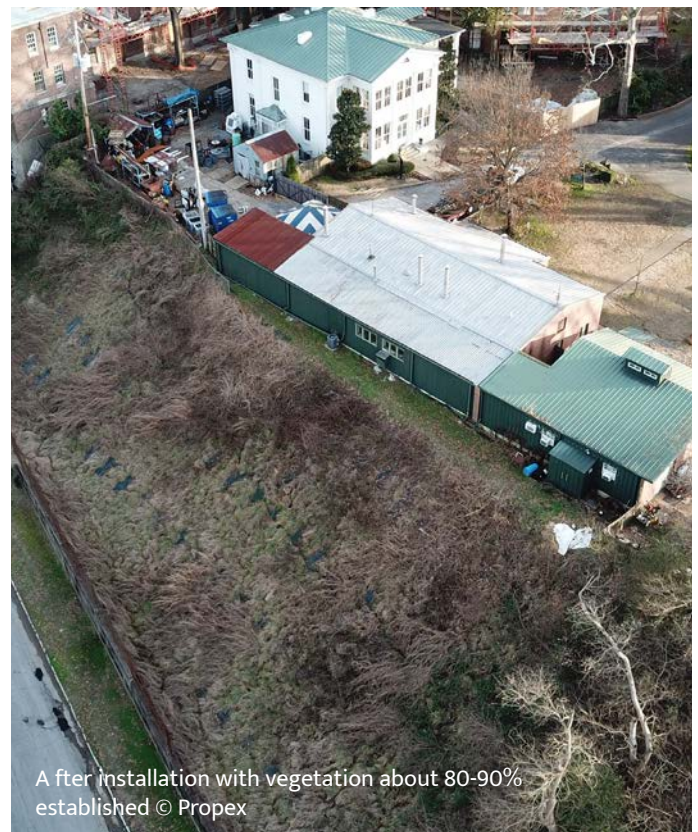
require significantly fewer truckloads of material, reducing transportation emissions by up to 95 percent.

ARMORMAX successfully stabilised the slope and the site has not experienced further sliding or erosion. The slope quickly vegetated, providing an aesthetically pleasing solution that complemented the beauty of the Metal Museum's campus.

For more than two decades, ARMORMAX has been used to reinforce embankments and slopes to protect transportation infrastructure. While it has most commonly been used to protect roadways, this same technology can be used to protect railways from slope instability.

**For more information about ARMORMAX, please contact Randy Thompson at [Randy.Thompson@PropexGlobal.com](mailto:Randy.Thompson@PropexGlobal.com)**

Installation © Propex



After installation with vegetation about 80-90% established © Propex

# SECURE AND SILENT BEDDING

PERMANENT WAY SYSTEMS PROTECTED BY CALENBERG

High performance rubber material for long-life tracks.

USM 1000 W

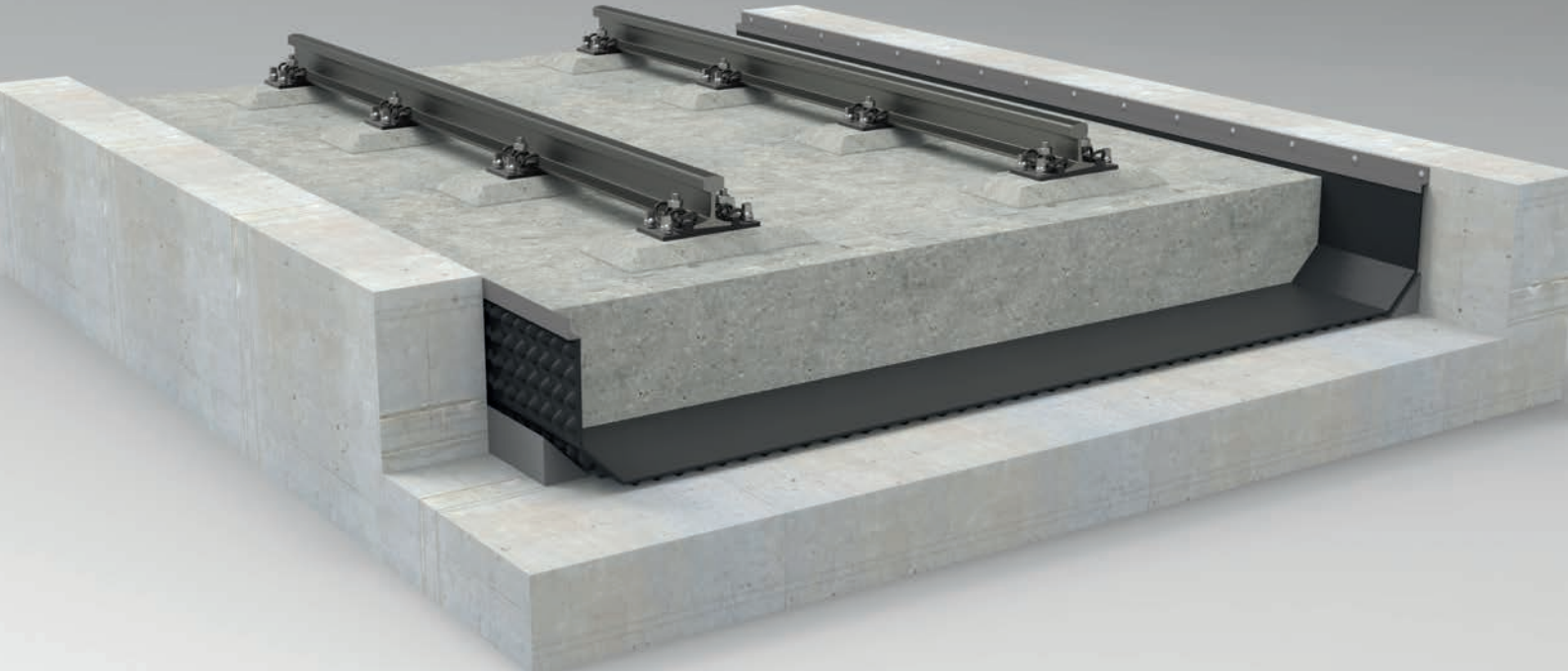
- Suitable for all modes of rail traffic
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- Waterproof and resistant against weathering
- Good insulation against stray currents
- For highly effective mass-spring-systems and low maintenance ballasted track



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Hall                      25

## Solutions for isolating the permanent way from the surroundings



### Effective vibration and structure-borne sound protection

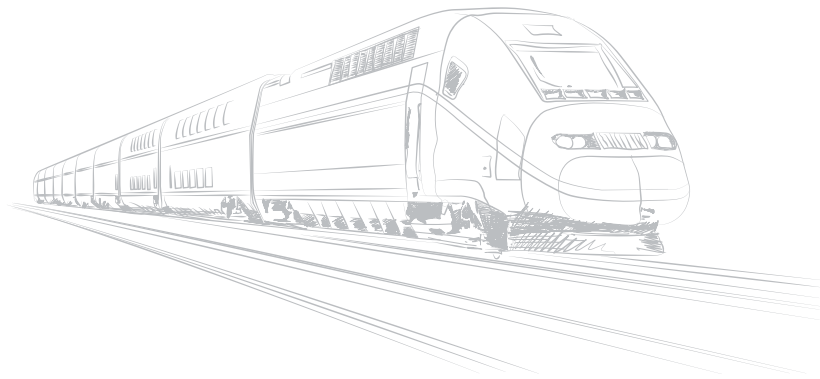
**Mass-Spring Systems** Different design variants as continuous elastic support, stripe or point support perfectly suit the needs and demands for your application. Due to their special design the USM series cover a wide range of natural frequencies and provide high insertion loss for a quiet living close to the track.

The most important benefits are: an expected service life of min. 60 years, no replacement required thanks to high fatigue strength, increased long-term stability for the track position as well as reduction in the dynamic wheel forces.

The different USM types consist of three functional layers united in one component. The conical studs on the underside of the mat are made from natural rubber and behave as single springs with an optimum static-to-dynamic stiffness ratio.

The textile fabric reinforced back forms the supporting layer for the studs and the composite component performs as a damping and protective layer that withstands any load impacts just like it does as solid stay-in-place formwork supporting the steel reinforcement cages in the construction of slab track. The mats have an overlapping strip on one of their longitudinal edges to allow effective butt jointing during placement on site.

The USM series complies with DIN 45673 and has been tested and proved by various official testing institutes.



The USM models are manufactured using high-grade rubber blends. They have a high mechanical load capacity and are permanently weather-resistant. The mats absorb virtually no water, excel thanks to their high electrical insulation resistance and provide drainage on the mat level.

The USM series is suitable for nearly all track systems, especially local transport railways and standard-gauge railways.



## Recent projects

**Cologne** The KVB looked for an effective technical solution to reduce vibrations and structure-borne-noise at a track triangle on Neusser Strasse in the district of Weidenpesch. Passing trams may cause vibrations which are then transmitted via the ground into the neighbouring residential buildings.

To protect the residents from these disturbing vibrations, a continuous mass-spring system was installed, which supports the turnout on top (floating slab track). For elastic decoupling, approx. 600 m<sup>2</sup> of Calenberg USM 2020 are used as floor and side mats. The floor mat is laid loosely on the concrete base. The side mat is fixed by means of a Z-profile. A rigid connection between the permanent way and the subfloor is interrupted by the mat. The USM 2020 reduces the dynamic forces acting on the surroundings in such a way that the residents are effectively protected from vibrations.



**Gera** The intention of the 1st construction phase at Wiese-straße is to obtain a reliable and low-maintenance track system, as hardly any major repairs to the track are possible due to a short cycle sequence of tram traffic. Furthermore, the surrounding buildings need to be protected from shocks and vibrations. In addition to the construction of a new track bed, a continuous mass-spring system is being built in this planning area. An elastic track bed mat will be used for the floating slab track, which will also serve as stay-in-place formwork. The implementation of the project is planned in time shifted construction phases, the completion of which is expected by the end of 2022.



The track support plate of the carriageway is mounted on Calenberg USM 1000 W as a floor mat. As this is a straight track section, the mat is installed longitudinally to the track. Civerso A is used as the side mat, which also provides a flexible solution to efficiently cover the numerous drainage boxes within the rail roadside.

Some of the advantages are:

- The profiling ensures all over drainage underneath the mat, no water absorption of the mat
- Shortened installation time due to longitudinal laying
- Concreting of the track support plate directly on the mat

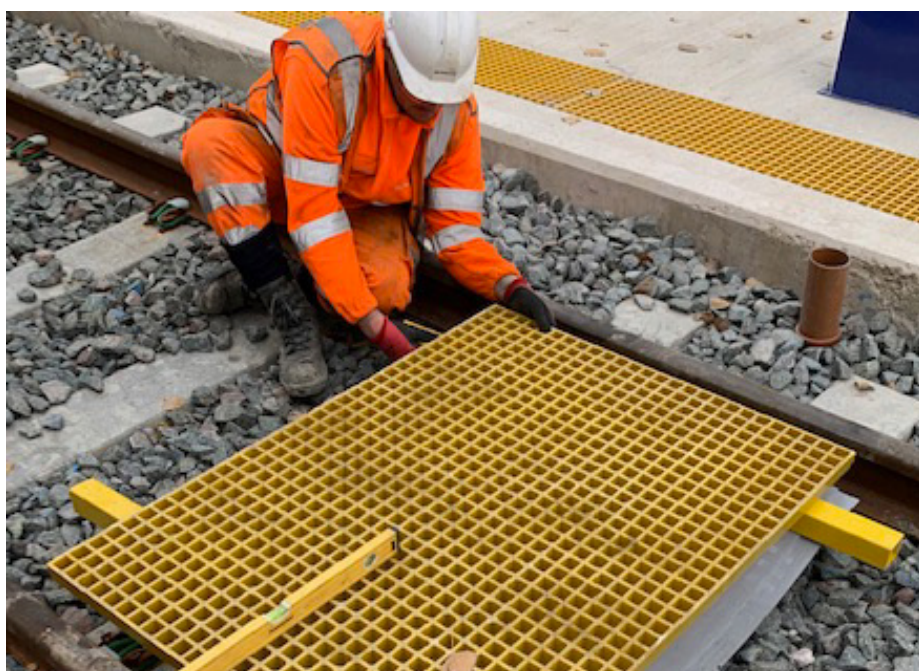
# UNIPART

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# RAIL

## TrackPan – Sustainable Innovation for the Railway



In order to have the ability to create and maintain a sustainable rail network for the future, it is important to source and implement solutions that reduce negative impacts on the environment.

A recent article in **EnviroTec Magazine** has demonstrated the impact that spills and planned discharge on railway facilities can cause. This includes an enormous harm to the environment and long-term health hazards as well as damage to the railway infrastructure and potential legislative actions. In addition, the costs and reputational damage

caused can be very expensive and in some cases irrecoverable – you can even be prosecuted!

### Reduce Environmental Impacts and Costs

The Trackpan system, manufactured within our supply chain partnership and made to approved standards

for the industry, offers protection by collecting fluids and substances and then transferring them to a proper waste treatment system. It is a proven method of fluid collection to meet today's exacting environmental legislation and stop ground contamination that can lead to prosecution and fines.

Compared with traditional steel and concrete applications, our solution provides an inexpensive and flexible alternative which is guaranteed for 25 years.

By using TrackPan, our customers can significantly reduce the risk of costly clean-ups and regulatory fines as well as reducing negative environmental impacts.

The TrackPan system has already been fitted at Aberdeen, Inverness, Glasgow Cadder, Heaton, Chingford, Wigan, Exeter, Oxley, Sheffield and Newton Heath. Systems are also in the process of being fitted at Clacton and Feltham.

### An Adaptable, Modular System

Our solution is quick and easy to install and can be put into service

within hours of delivery – all assembly hardware is supplied and the pans are fixed to the existing railway sleepers. It also has the flexibility to be relocated to another location if depot operations change. Each unit is manufactured to provide the maximum self-containing capacity whilst adhering to railway clearance standards.

The modular system allows additional sections to be added or reconfigured. If a section becomes damaged its construction means that only the damaged sections need to be replaced.

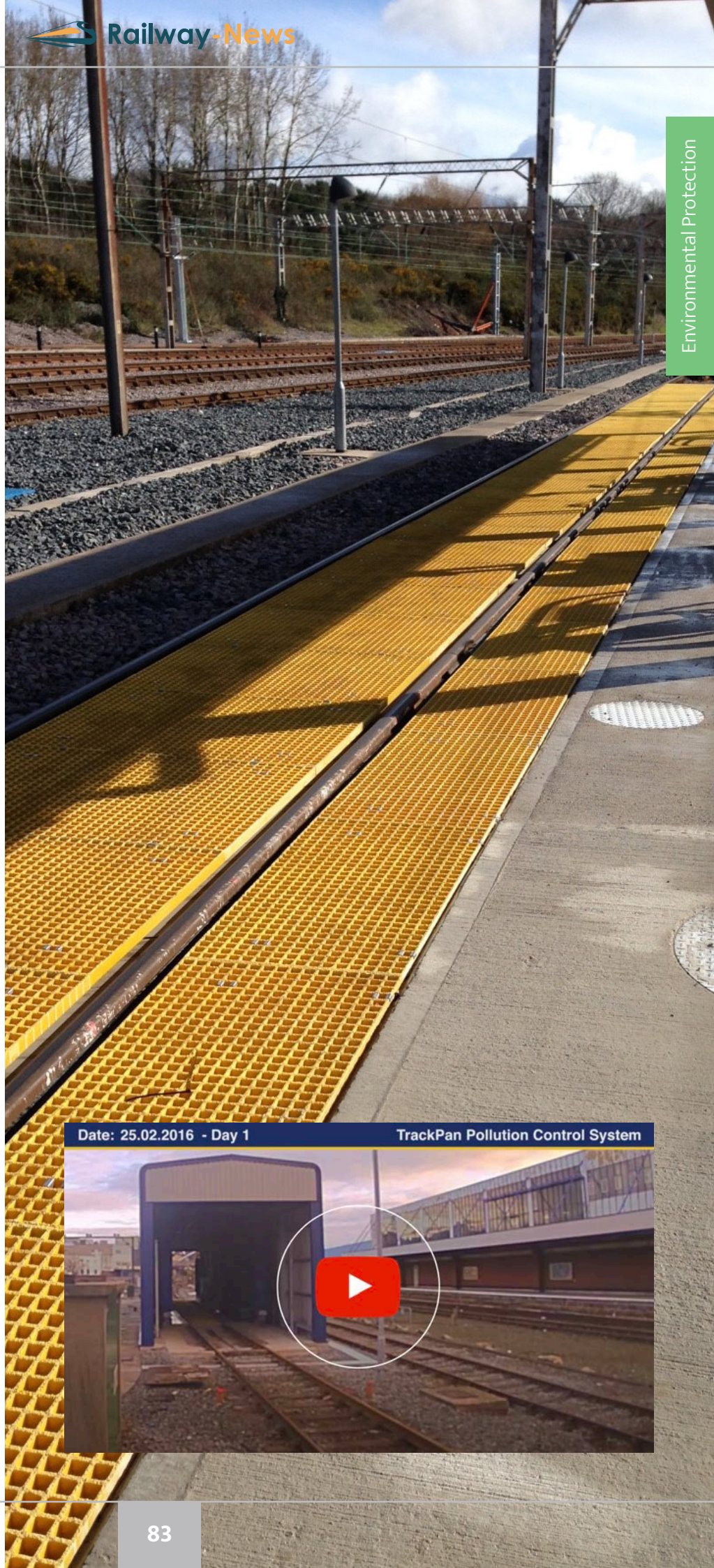
## Our Commitment to Sustainability

Unipart Rail is committed to managing our operations in a way that is sustainable and environmentally sound. We apply our Unipart Way philosophy, tools and techniques to continuously improve operational efficiency and environmental performance and this commitment is reflected in our products and solutions.

Visit [www.uniparttrail.com/trackpan/](http://www.uniparttrail.com/trackpan/) for more information or contact Chris Elliott, Product Manager at [Chris.Elliott@Uniparttrail.com](mailto:Chris.Elliott@Uniparttrail.com) who will be able to assist you.

### PDF

Read our case study to understand how the rail industry has benefited from our solution.



Date: 25.02.2016 - Day 1

TrackPan Pollution Control System



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&lt; Infrastructure

# Zonegreen

## Zonegreen Ensures Eastcroft Depot Safety Is on Point

There is no doubt that the rail industry is a potentially dangerous place to work. Employees work alongside high-voltage electricity, speeding vehicles and powerful machinery on a daily basis. Amongst the risks that depot personnel regularly face is the operation of manual hand points.

The occupational health risks that such a job entails are great; as staff often have to walk across poorly lit, uneven terrain to pull heavy switch levers that can require up to 103kgf to move. Operating heavy manual points whilst standing on an uneven surface or working in poor conditions could lead to lasting physical damage, which not only

causes the employee suffering and lost working days, but could also result in more serious incidents.

### Risk and Effect

The RSSB Workforce Safety 2019/20 report recently concluded that there has been an 'increase in recorded major injuries, including instances of staff injured when using equipment'. It is no surprise then, that accidents involving hand points are commonplace.

Increasingly, depot operators are recognising that action is needed. However, fully automated signalling systems that new depots benefit from are often cost prohibitive for existing facilities. Recent advances in technology now offer the opportunity to reduce the dangers faced by depot staff at a more economical rate, with the implementation of systems such as

Zonegreen's Points Converter.

The latest operator to address the dangers hand points present is East Midlands Trains. Zonegreen is expanding the services it offers to Nottingham's Eastcroft depot, following the installation of its Points Converter technology.

### Pointing Eastcroft in the Safe Direction

Eastcroft depot is the latest to benefit from Zonegreen's state-of-the-art-system, which automates the traditional manual levers that alter the course of a rail track.

The system is tailored to the meet the facility's needs and designed to increase railway depot and sidings safety, allowing the automation and remote operation of manual hand point/switches.



Zonegreen has installed a Points Converter on a set of points that control the head shunt at Eastcroft. The depot already benefits from the firm's flagship Depot Personnel Protection System and this latest innovation will further enhance the safety of its staff, removing the need for the train driver to dismount and operate the points lever manually.

The Points Converter is controlled by a key switch panel, situated on a local walking route, meaning staff do not have to navigate ballast to operate the point – one of the main causes of slips, trips and falls in rail depots. The system is also designed to enable more converters to be added, along with a centralised control system, should it be expanded.

The Points Converter attaches directly to the hand point mechanism and moves the switch with a hydraulic actuator, maintaining its structural integrity and requiring minimal civil work to install. It can still be operated manually if power is lost, for

example, as the switch is moved with an actuator that combines with the original spring to hold it against the stock rail and the existing manual lever is retained in its position.

Multiple units can be linked and operated from a safe distance, using a remote handset that enables predefined routes to be programmed in advance, thus reducing risk and lowering the accident rate. It also includes a logging system, allowing the depot manager to track points operation and record safety events.

## The Solution

Christian Fletcher, Zonegreen's Technical Director, said: *"The latest industry research shows that nearly half of all major railway injuries were attributable to slips, trips, falls or manual handling. It seems incredible that, despite the risks involved, staff are still navigating uneven terrain at all times of the day to access manual points. It is, therefore, essential that we*

*mitigate this risk wherever possible. Points Converter is a cost-effective way to automate this procedure and not only prevents potentially fatal injuries but also increases the depot's efficiency, by eliminating many stop/starts when vehicles are being moved around."*

As well as assisting in the prevention of accidents, the Points Converter also greatly reduces the significant physical strains that depot personnel face with regards to operating points manually and the lasting damage this can have on the body, particularly the back and neck, by automating the process.



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🌐 [www.zonegreen.com](http://www.zonegreen.com)



# 2 Great Shows, 1 Exciting Rail Event Joining Forces to Shape the Future of UK Rail

**When:** 7–9 September 2021

**Where:** NEC, Birmingham

## Exhibition Profile

Railtex and Infrarail have successfully served the rail market for over 20 years, and for the first time in 2021, the UK's most important events in the rail calendar will come together to form the ultimate show for the industry. The co-located event will provide an unparalleled opportunity for companies serving all aspects of the infrastructure and rolling stock sectors to present their products and services, meet new and existing customers and be part of the industry's networking event of the year.

The UK remains a healthy market for national and international

companies active in the rail sector. Significant improvements are being made to UK's rail network: more than 48 billion GBP will be spent over the next five years. Many major new rail projects such as HS2, the Great North Rail Project, Crossrail 2 and the TFL Four Lines Modernisation amounting to billions of pounds are underway or planned.

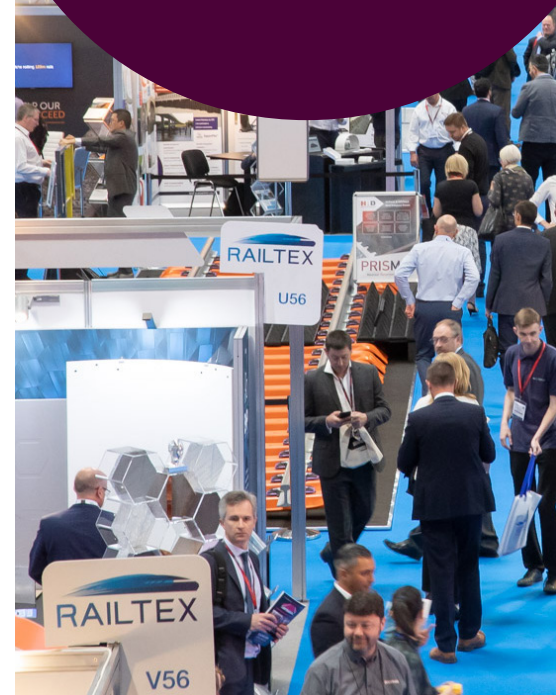
## More Than Just an Exhibition

The event will deliver a diverse supporting programme, offering several new features that will enhance the exhibitor and visitor experience, making this edition a must-attend!

- Strong conference programme with 40+ speakers
- Two conference streams
- CPD-accredited programme
- On-track display
- Recruitment wall
- Plant and machinery exhibits

*"Infrarail 2018 was a great opportunity for us to promote new product innovations, which have been very well received by many customers. We'll be back."*

**Strategic Key Account Manager,  
Hilti Great Britain**





## New in 2021!

- Matchmaking
- First Time Exhibitor Zone
- Railtex/Infrarail Awards Evening

## Exhibitor Profile

More than 180 categories of products & services will be represented at the event. If you supply products/services in any of the following areas, then exhibiting at Railtex/Infrarail 2021 should be part of your marketing plan.

- Rolling Stock
- Railway Civil Engineering
- Track Design, Supply & Construction
- Track & Infrastructure Maintenance
- Electrification
- Signalling & Communications
- Depot & Workshop Equipment & Services
- Plant & Equipment
- Safety & Security Systems
- Electrical Products & Equipment
- Measurement, Monitoring & Testing Systems
- Information Technology
- Station Equipment & Passenger Technology
- Human Resources & Occupational Health
- Consultancy & Specialised Services

## Top 5 Reasons to Exhibit

- Let your audience know you're still in business!
- Consolidate your prospect database and generate new sales leads
- Discover the latest developments in the rail industry
- Meet new partners and close deals at the event
- Find out more about competitors



## Who Can You Expect to Meet?

Railtex and Infrarail have been the UK industry's favourite meeting places for over 25 years and, combined, welcome over 10,000 visitors from 50 countries.

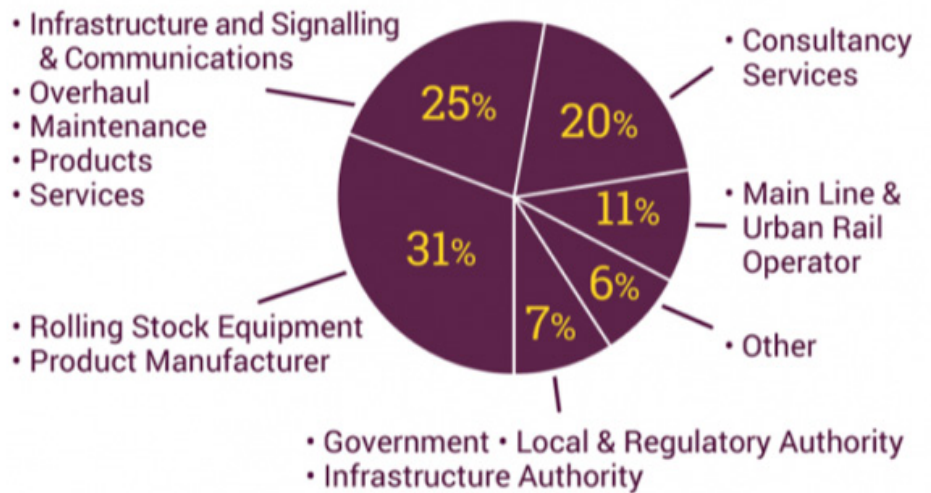
Previous Visitors  
Included  
Representatives from:

- **ATKINS**
- **Arup**
- **Balfour Beatty**
- **CAF**
- **Costain**
- **Crossrail**
- **DfT**
- **Hitachi Rail Europe**
- **Keolis Amey**
- **London Underground**
- **Network Rail**
- **Siemens Rail Automation**
- **SNCF**
- **TfL**
- **Thales**
- **Transport Scotland**
- **Trenitalia**
- **VolkerFitzpatrick**

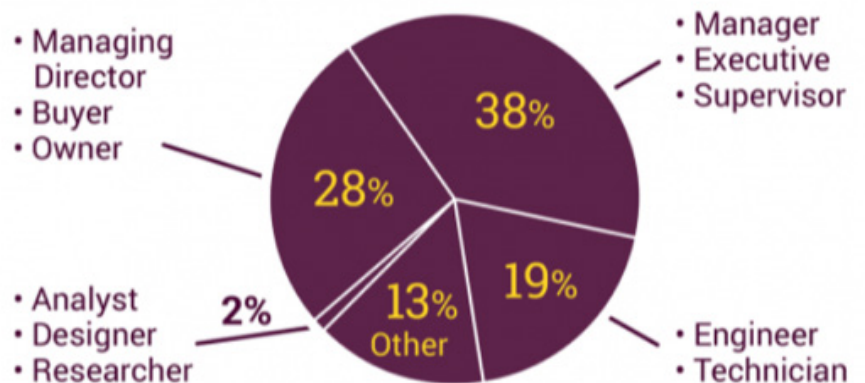
## The Midlands – A hotspot for Rail Activity

The NEC is the dedicated venue for all recent Railtex events. The exhibition centre is located at the heart of the Midlands region and is easily accessible by train, plane or car. The region is home to 250+ globally renowned rail companies, 9 rail and engineering specialist colleges, 5 rail test facilities and 20 rail centres of excellence. All these elements make the Midlands a key industry hub, connecting the country's rail sector and making it the perfect location to host the UK's premier rail event.

## Visitors Primary Activity



## Visitors by Job Function



## An Unmissable Event

With an international audience of visitors from more than 50 countries around the globe and hundreds of exhibitors from across the entire rail supply chain, the co-located event is an unmissable opportunity for stakeholders active in the rail market.

If you would like to attend or have any questions,  
please contact the Railtex/Infrarail team at [uk-railhub@mackbrooks.co.uk](mailto:uk-railhub@mackbrooks.co.uk) or on  
+44 (0)1727 814 457

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# As Easy as a Mobile Phone for Your Vehicle

## on4850 – The First Mobile 5G Data Centre

On public transport, life looks different every day: various systems are installed, and every application needs separate hardware, software, antennae and mobile lines. The on4850 data centre is like a mobile phone for your vehicle – it brings together a range of different applications on a single device.

The **on4850** is a fanless, maintenance-free server/router

for on-board applications in the transport sector, such as buses and trains.

Thanks to container virtualisation, several applications including passenger information, entertainment, passenger counting and storage of monitoring data can be operated simultaneously on the same hardware. Quality of service and firewall functionalities ensure that different security and capacity requirements can be met at all times.

The on4850 is completely installed and maintained via our cloud-based management system. Only in this way can innovative mobility

applications be flexibly installed, tested and also continuously updated with new functions/releases without having to go on site.

### Multiple Skills to Cover All Communication Needs

The on4850 serves as the communication centre for all applications. Up to six 5G cellular modems provide a bundled vehicle-to-ground connection at gigabit speeds. 802.11ax WLAN, Bluetooth, LoRa and Zigbee are other supported radio technologies,

including for IoT applications and communicating with passengers' devices. Four gigabit ethernet connections provide the systems and users in the vehicle with

sufficient capacity to entertain passengers with video streaming while travelling, for example. Other available interfaces include CAN/FMS, USB, RS-232 and GPS/GNSS.

We would be happy to answer any questions you may have.

[info@onway.ch](mailto:info@onway.ch)  
[www.onway.ch](http://www.onway.ch)



# As easy as a mobile phone for your vehicle

50 – the first mobile 5G data centre

**onway**

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## Boosting In-Vehicle WiFi

The provision of virtually unlimited onboard bandwidth for media streaming could potentially allow transport operators to benefit from entertainment services for free, says Ralf Cabos, PaxLife Innovations CEO.

### The New Era of Media Streaming

Media consumption patterns are changing dramatically. Traditional linear TV is experiencing a significant decline these past years; there has been a shift in viewership towards streaming platforms. In the United States, according to a study from Nielsen, “overall streaming is now 25% of TV viewing”. Likewise in Europe, numerous launches of international and national

direct-to-consumer SVOD services (subscription video on demand services, such as Netflix) by media players have led to a rapid rise in consumers’ preference for accessing content anytime, anywhere and on any device: OTT SVOD subscriptions have passed from 300,000 subscriptions in 2010 to over 140 million in 2020 (source: European Audiovisual Observatory “Trends in the VOD market in EU28”). And this starts to lead to advertisement budgets being rebalanced towards digital media streaming channels.

### A Challenge for Transport Operators

So, in the public transport world, in principle, in order to meet today’s media consumption demands, the entertainment services that are defined in transport vehicles and promoted to passengers should eventually reflect this major shift in consumers’ media habits. Passengers – especially younger ones – are indeed increasingly expecting onboard seamless and

reliable access on their personal devices to media streaming apps and their diverse content, as they do at home. In an ideal world, to make this work, transport operators would then provide easily enough bandwidth for everybody to consume as a basic service.

The reality is however somewhat different: there are currently limitations that you cannot avoid. Firstly, the limitations are related to the number of existing 4G towers which may not be sufficient in some areas, meaning that in the countryside coverage may remain poor or even non-existent. Secondly, even with good mobile coverage usually in more urbanised areas, the number of SIM cards required for the on-board WiFi system to support the ever-increasing entertainment needs of today's passengers will not be at all an economical and viable solution for operators either today or tomorrow.

**So, what then? How to satisfy passengers with an affordable solution for transport operators?**

## Bringing Standard WiFi Systems Installed in Vehicles in Line with Media Streaming Consumption

In the everyday digital world, the delivery of media apps to people at

home (or in hotels, in stations etc...) relies on content delivery network (CDN) companies. In summary, these CDN companies ensure the quality of the media delivery up to the end users to their devices, in a *fixed* environment.

For *mobile* environments, such as trains, buses, or other means of transport, PaxLife Innovations has come up with a similar software CDN platform, embedded in vehicles, that ensures that supported media applications are reliably delivered locally from the onboard server to passengers' devices throughout the journey. The server is synchronising with media content via high-speed connections available along the route (initially at stations); so at the end the system works with the media apps running onboard and getting accessed by passengers' devices regardless of the external connection, **without increasing broadband data charges**.

**In this way, the vehicle's 4G/WiFi bandwidth is preserved for other usage**, for other passenger services or even to the benefit of the operator.

Moreover, this architecture brings significant additional benefits to the transport sector and passengers: once the platform is in place, transport operators no longer need to buy a limited set of films, series or TV shows, for which the cost of licencing is

notoriously high; and at the same time, passengers benefit from fast and reliable access to a much wider choice of media content than is available on trains today.

## PaxLife Innovations Brings a Plug-in and Fully Managed Proposition

### On-Demand Video, Podcasts or News

As a standard service, national and local public radio and TV applications hosted on-board work at the vehicle's intranet speed. This allows passengers to enjoy compelling on-demand content (video, music and news) on their own devices the same way they experience it outside the vehicle, in good reception quality, interruption-free and with no strains on their mobile data budget. The seamless integration of any private media streaming platforms – AVOD and SVOD players – who are interested in connecting with more viewers on the go, is also possible.

### Live Audio Streaming

The service is based on the vehicle server relaying one single live stream onboard that all passengers can access individually, in high quality, and as they wish. This architecture makes it possible to avoid any pressure on the vehicle's 4G connectivity system, while

ensuring passenger satisfaction at the same time. Live video streaming is under development and should be launched by the end of 2021.

### Digital Radio, Interruption Free

Each passenger accesses up to 32 live channels on personal devices (depending on the DAB+ coverage).

This DAB+ add-on achieves uninterrupted live radio transmission by combining both a 4G connection and DAB+ stream delivery. The system optimises buffering and other settings

depending on the current train position.

### Combining the Monetisation of the Passenger Information Displays

The technology easily integrates into the existing PIS (Passenger Information System). PaxLife Innovations is now working with advertising partners to re-use the logic within the CDN platform to connect to the vehicle's infotainment screens that transport operators would have given access to, not for broadcasting content but for the placement of

advertisements: if done well, this could generate sufficient ancillary revenue to cover the deployment and operations of the entire entertainment services described previously.

So from the transport operator's perspective, **it means that the current challenge about offering sufficient WiFi bandwidth could transform into a tremendous benefit for the passenger experience** and, depending on the number of screens, on the number of annual passengers and the passengers dwell time, it could even be done at **no cost**.



## Make the Most Of Your Onboard WiFi

If you would like to know more, please check [www.paxlife.aero](http://www.paxlife.aero) or contact us directly at [info@paxlife.aero](mailto:info@paxlife.aero) / [delphine@paxlife.aero](mailto:delphine@paxlife.aero) +49 (0)331 243424 -0. We would be very pleased to discuss further with you!

# DAMM frequency sharing functionality

The launch of the frequency sharing functionality in the DAMM Outdoor Base Station BS422 is here! With this functionality it becomes possible to...

## Improve spectrum efficiency

Frequency sharing allows adjacent BS422s to use the same frequencies. This is a significant benefit in low density networks and gives the possibility to cover for example a railway line with just two frequency pairs.

## Simplify repeater systems

With frequency sharing an indoor repeater system can be built without optical fibres. The same hardware can be used as base station and repeater unit, increasing redundancy and simplifying the network architecture by having one unified network management system and reduced spare part stock.

## Obtain base station geo-redundancy

With the BS422, network availability can be brought to a new level. Two BS422s located at two sites can act as one fully redundant base station, sharing the same frequencies. This will add redundancy not only to the base station, but also to the whole antenna system.

To learn more  
please go to  
[dammcellular.com](http://dammcellular.com)

### DAMM Cellular Systems A/S

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Email: [sales@damm.dk](mailto:sales@damm.dk)  
[www.dammcellular.com](http://www.dammcellular.com)

  
Critical communication made easy



Critical communication made easy



## Maximising the Performance and TCO of Critical Radio Communication Networks

Network designers planning rail or metro networks need to ensure a cost-efficient system that provides the necessary coverage and availability while keeping network management simple.

In this process they meet a number of challenges, which typically include:

- Frequency scarcity and costs
- Avoiding complicated systems and system management
- Building resilience into the design
- Maximising total cost of ownership (TCO)

Choosing a system built around DAMM's flexible and scalable MultiTech Outdoor Base Station BS422 enables you to avoid many of the structural problems involved in building resilient, cost-effective and high-performance radio networks.

### Factor 1: Frequency Scarcity and Costs

Spectrum acquisition is a major challenge. In some jurisdictions, accessing sufficient frequencies can be difficult, while in others, the cost of frequencies can restrict your options for building a functional network with high availability.

Spectrum efficiency is key regardless of whether you are operating a busy railway or metro

line with a considerable number of subscribers or a freight railway line in a rural area with few subscribers. Whichever type you are operating, you need enough frequencies to cover the whole line. However, in a setting with few users, the number of frequencies used is often disproportionate to the number of users, creating unnecessary licence costs. For instance, to cover a linear application such as a rail line from end to end normally requires around five or six frequency pairs. This can be a problem in regions where frequencies are either expensive or scarce.

Using DAMM frequency sharing, the same frequency pairs can be used on four adjacent sites, creating one large radio cell. With this setup, a frequency pair can be reused after just one other such large radio cell. This means that the same availability can be achieved using just two frequency pairs.

This provides a solution that

addresses the problems of frequency scarcity and costs by allowing you to configure base stations to share frequencies and designate DAMM BS422s as repeaters.

## Factor 2: Avoiding Complicated Systems and System Management

In an indoor or tunnel setting ensuring sufficient signal strength and capacity is key. This is typically ensured by using optical and off-air repeater systems and distributed antenna systems (DAS). However, this adds additional layers of network operations and management, increasing complexity without necessarily delivering the intended benefits. Additional operational costs are incurred by having to train staff on multiple systems, while installation, management, monitoring and

maintenance are all more time-consuming.


To overcome these challenges and create a dense, resilient network, you can build a network of overlapping DAMM BS422s. This will deliver the functionality and resilience needed while reducing complexity and associated costs.

## Factor 3: Building Resilience into the Design

In critical communications networks it is imperative to ensure high availability and resilience. This means engineering the network for adequate coverage, building resilience into the network design by overlapping base station coverage to protect against the danger of communications collapsing in the event of one base station breaking down or losing connectivity.


### DAMM CELLULAR SYSTEMS

PRESENTS



## DAMM FREQUENCY SHARING

### RAILWAY LINE COVERAGE



Using the DAMM frequency sharing functionality, a DAMM BS422 configured as a slave unit can automatically take over the functionality of the master unit adding extra resilience to the network through redundancy.

When it comes to sensitivity the DAMM frequency sharing functionality also outperforms the traditional repeater setup. Unlike conventional repeaters the DAMM BS422 does not degrade receiver sensitivity. Thanks to the superior RF performance compared to any repeater, you also get better coverage.

## Factor 4: Maximising Total Cost of Ownership (TCO)

The key driver in most instances is costs. Network planners will therefore always try to build a network that covers all needs

at the lowest cost possible. This includes looking at optimising tunnel coverage, frequency use and ensuring resilience.

DAMM's frequency sharing solution markedly improves TCO across a number of parameters. Fewer licences are needed to cover the same area and there is no need for dedicated optical fibres to support a separate DAS system. Because staff only need to be trained in one type of hardware and software, training costs and effort are also reduced.

Maintaining one system instead of two is less expensive in itself. Having a fully redundant DAMM BS422 system, the system can even be kept running during maintenance, eliminating costly downtime. In addition, a repeater can be re-configured as a base station with a simple software license. Whether used outdoors along a railway line or indoors in a tunnel, frequency sharing with the DAMM MultiTech Base Station BS422

makes it possible to build coverage in a completely new way: Simple, cost-efficient and reliable.

## DAMM Frequency Sharing Is Ideal for:

- Tunnel coverage for transit/transport, instead of optical repeater DAS
- Coverage along a straight line with towers of similar height such as railway applications

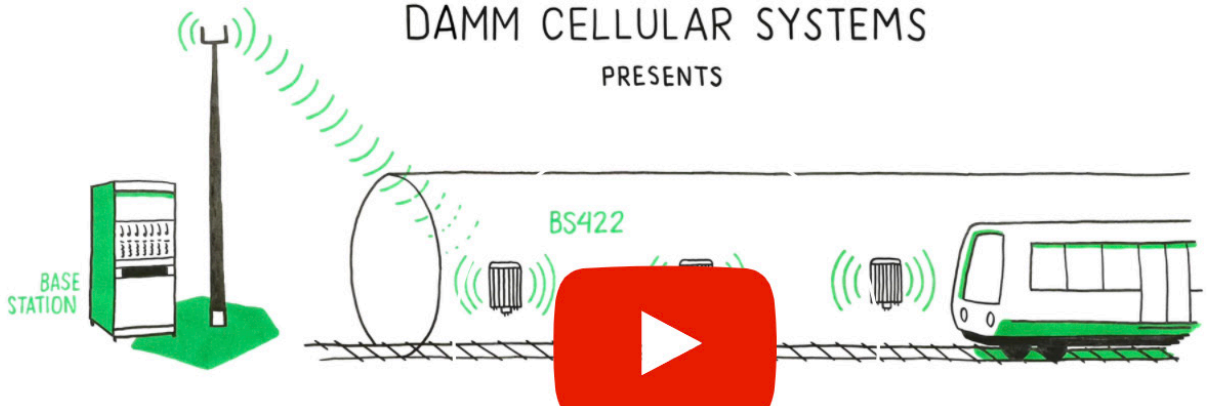
Want to learn more about DAMM frequency sharing? Visit <https://www.dammcellular.com/damm-frequency-sharing/>

To learn more about our products and solutions and how we can help you, please contact:

**Pablo Rocha**  
Regional Sales and Global  
Transportation Business  
[pr@damm.dk](mailto:pr@damm.dk)


# DAMM CELLULAR SYSTEMS

PRESENTS



## DAMM FREQUENCY SHARING

### PROVIDING TUNNEL COVERAGE



# Wireless and wireline solutions for railway networks

CommScope offers a comprehensive suite of mobility solutions for railway network communications, connecting railway employees with one another, trains to automated safety systems, and passengers to digital networks.

Our fibre and copper solutions are made to meet evolving passenger technology demands. They provide mobility solutions while overcoming challenges specific to railway networks to help them operate smoothly at any speed, location, and environmental condition.

Visit [commscope.com](https://commscope.com) to learn more.



COMMScope®

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# COMMSCOPE®

## Why Choose the Node AM Digital Repeater for In-Train

CommScope's Node AM is a universal multiband, multiservice digital repeater capable of meeting the needs of rail operators in challenging multiband, multi operator applications.

Mobile coverage on trains is now a key requirement for passengers. Understandably so, as a high percentage of rail users 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.

However, trains present extremely challenging radio frequency (RF) environments, as changing terrain and signal levels across the various networks can make it difficult for operators to provide the coverage and service customers expect.

### Node AM Digital Repeater for In-Train

CommScope provides solutions

designed to meet the communication challenges specific to railways around the world, and our extensive portfolio of solutions is built upon decades of industry experience and leadership.

Our Node AM is a universal multiband, multiservice digital repeater capable of meeting the needs of operators in challenging multiband, multi operator applications, whether the requirements call for 4G (LTE/LTE-A), 3G (UMTS), or 2G (GSM, GPRS, EDGE), or a combination of all.

### Quick and Easy Set Up and Monitoring

Node AM seamlessly links to CommScope's integrated management and operating system,

A.I.M.O.S. The repeater's intuitive auto set-up wizard and help screens enable easy system configuration, minimising set-up time and reliance on bulky test equipment, while advanced quality of service (QoS) measurements and reports – including inbound and outbound measurement of channel power, pilot power and received signal strength indication (RSSI) – verifies ongoing system operation.

### Compact, with Low Power Consumption

The digital repeater supports up to four frequency bands in a single chassis. Its modular, scalable architecture enables users to modify, upgrade or expand the repeater platform in minutes by simply adding RF cards and software



features, and importantly, without increasing installation space.

Furthermore, the platform is available in medium and high-power classes, making it ideal for driving radiating cable and passive distributed antenna systems with the lowest possible power consumption.

## Wireless Coverage Applications

Node AM excels in a wide range of wireless coverage applications including, but not limited to:

### Arriving and Departing Train Stations

When arriving in or departing from a train station, a digital repeater

must deal with the strong RF signals coming from nearby base stations. Node AM's trailing feature enables the repeater to adapt to the environment, continuously changing its gain and noise level to prevent interference.

### Passing Green Field Areas

Node AM's high dynamic range allows for operation in the presence of strong transmitters without the need for external filtering or attenuation. Its advanced capabilities allow only the desired signals to be transmitted, resulting in optimum utilisation of its output power capacity.

### Entering a New Country

When crossing into a new country, Node AM's embedded GPS receiver

allows automated frequency allocation based on GPS position. With the ability to add all worldwide sub-band configurations, the digital repeater provides a standard solution for all train manufacturers and wireless operators.

## Find Out More about the Node AM Digital Repeater

For more information about the Node AM Digital Repeater for In-Train, or the wider range of CommScope solutions, please [visit our website](#) or [contact your local CommScope representative](#).

**COMMSCOPE®**

# Choosing the Right GNSS Antennas for Your Rail Needs



With a wide range of high quality precision GNSS antennas and deep expertise, Tallysman® can support the successful implementation of any GNSS system for rail.



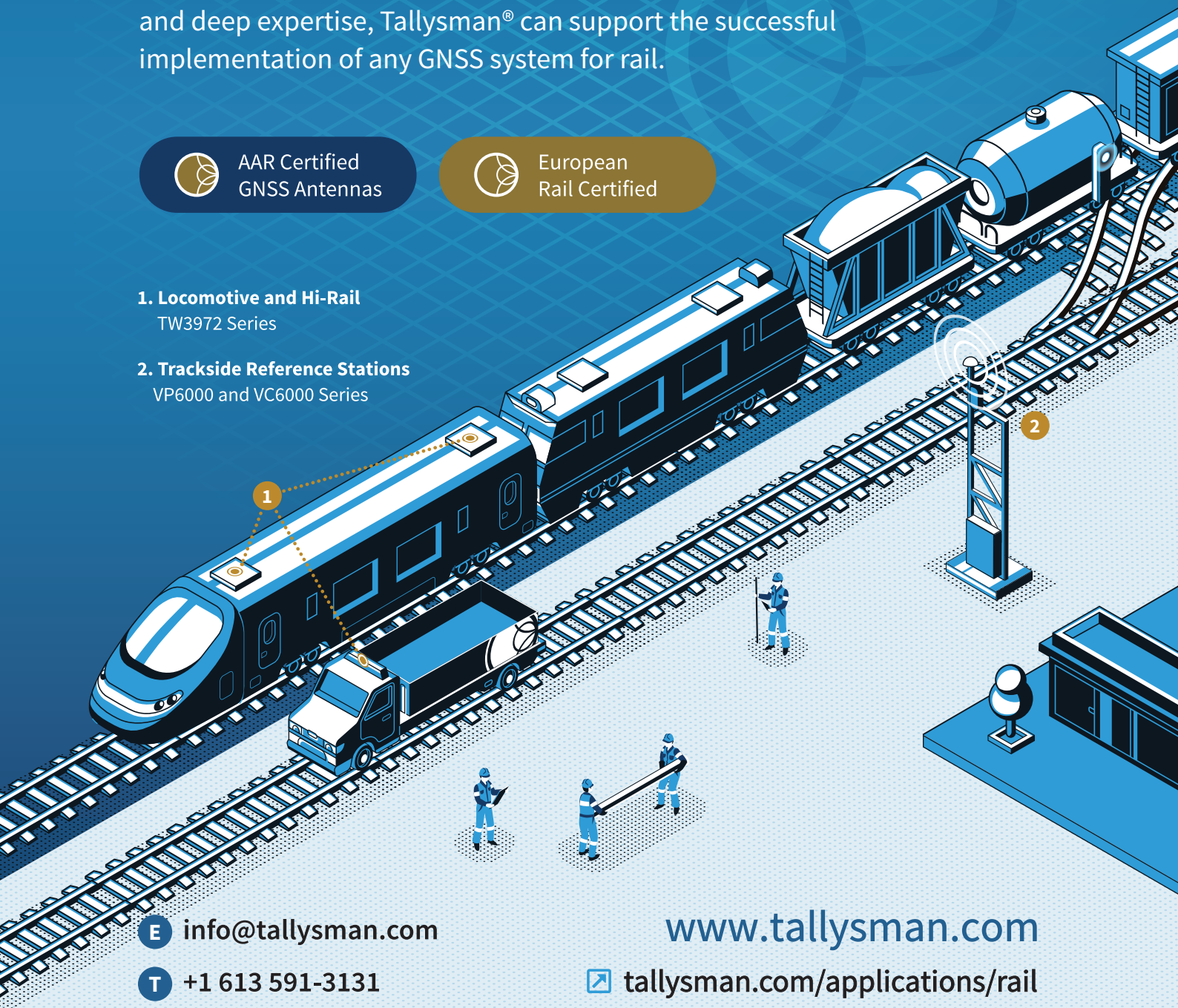
AAR Certified  
GNSS Antennas




European  
Rail Certified

**1. Locomotive and Hi-Rail**  
TW3972 Series

**2. Trackside Reference Stations**  
VP6000 and VC6000 Series



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 [tallysman.com/applications/rail](http://tallysman.com/applications/rail)

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# Tallysman

## Precise Positioning for Railway Vehicles

### Achieving Reliable Train Location with GNSS Antenna Solutions

Government agencies in the USA (Federal Railroad Administration), Europe (European Union Agency for Railways), and other jurisdictions are now seeking to increase productivity and improve rail safety through the application of new GNSS precise-positioning technology.

Legacy train location systems have largely relied upon earlier generations of GNSS equipment, which generally used single-band

signals (typically the US GPS system), with or without corrections services.

These legacy single-band “GPS” receivers determined location by trilateration on “pseudo-ranges” derived from estimates of the time of flight of signals broadcast by multiple individual satellites. This basic concept (wonderful in its time) provides for positioning of a stationary receiver within approximately 2–3 metres in ideal conditions and much worse in challenging environments. As a result, consumer satellite navigation devices used map locking techniques to present a “most likely position,” which provides an illusion

of improved accuracy.

Decimetre or centimetre accuracy can only be achieved by measuring the distance as a function of carrier phase cycles from the satellite to the antenna. This technique requires that the GNSS receiver phase lock a “local” clock for each of the RF carriers of tracked GNSS satellites. Phase measurements provide a big improvement in accuracy and resolution but require very high performance from the GNSS antenna.

GNSS correction systems can provide 2–3cm level positioning through real-time kinematic (RTK) systems, in which the accuracy

of a “rover” receiver is precisely derived relative to the location of a second, fixed, surveyed-in, local reference station. This setting relies on the cancellation of errors by differencing techniques, made possible by essentially common signal paths for the rover and reference receivers. However, when the sky view is restricted or blocked, GNSS accuracy will degrade, and other sensors, such as inertial measurement units (IMUs), may be useful.

Measurement of the carrier phase to within a few degrees ( $360^\circ \approx 20\text{cm}$ ) requires that the antenna receive all tracked signals at a single, common point in space. This point is the endpoint of an RF tape measure, otherwise known to antenna engineers as the antenna phase centre (PC). To minimise signal phase errors and “smearing” of the receiver correlator peaks that result from reflected signals (commonly referred to as multipath), the antenna must also provide high rejection of cross-polarised signals and high left-handed circularly polarised (LHCP)

signals rejection, as GNSS signals are RHCP.

## Meeting the Needs of the Railway Industry with Tallysman’s Wide Range of GNSS Precision Antennas

The TW3972 antennas are small, multi-band antennas that provide a phase-centre variation of approximately 2cm and are ideal for locomotive and road-rail vehicle positioning. However, these vehicles are large reflective objects. Multilevel reflections of GNSS signals can pollute the “pure” direct signals, so engineering evaluation is recommended and will greatly improve the antenna performance.

The VP6000 and VC6000 family of wideband antennas cover all GNSS signals, including L-Band corrections. The performance of the VP6000 can rival the VC6000 (choke-ring antenna) in low multipath environments but are

lighter and more compact.

With a phase centre variation of  $\pm 1\text{mm}$  (yes mm), and strong multipath mitigation, the VP6000 is an ideal trackside RTK base station.

The VC6000 is among the most accurate reference station antennas available. The VC6000 choke rings make it an ideal antenna when multipath signals are present. And the story doesn’t stop there. Increasing use of Radio spectrum, particularly Cellular (LTE and 5G), Iridium and Inmarsat (to name a few) have high amplitude interfering signals close to GNSS signal frequencies. Preventing saturation or intermodulation interference poses a significant challenge. Tallysman offers all these antennas with super tight prefiltering for operation in difficult RF conditions.

**For more information about Tallysman’s GNSS Antenna Solutions, please contact us:**

**E: [info@tallysman.com](mailto:info@tallysman.com)**  
**P: +1 613 591-3131**

TW3972 Series © Tallysman



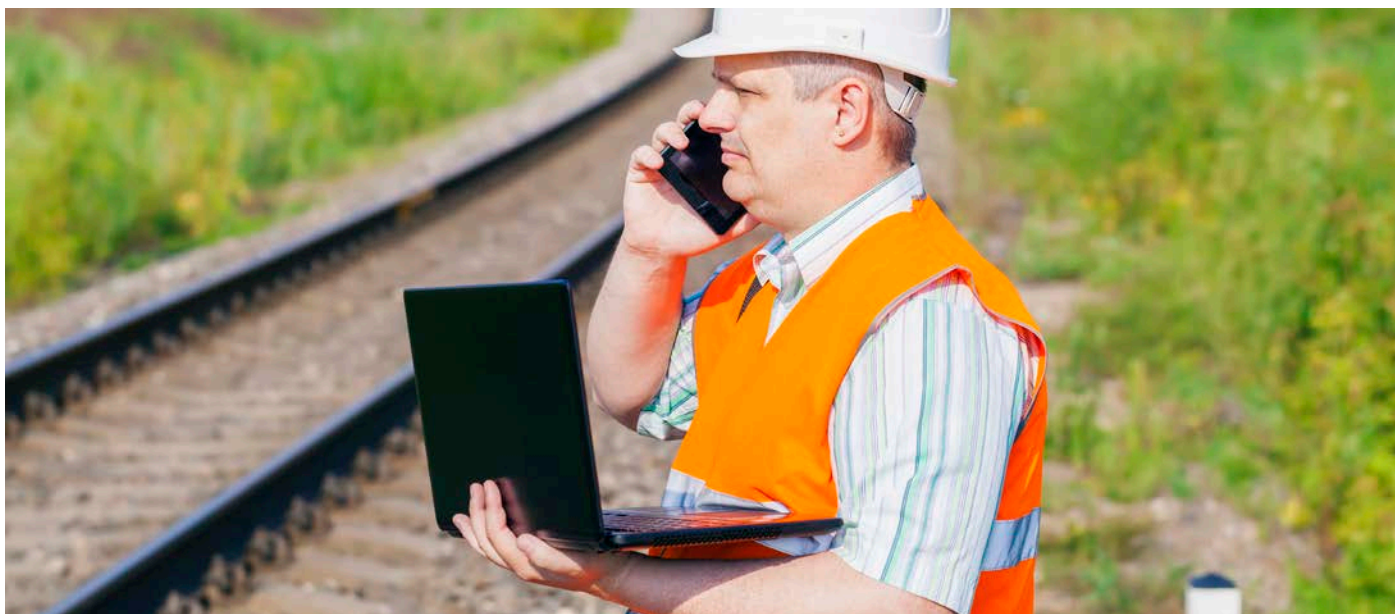
VP6000 Series © Tallysman

VC6000 Series © Tallysman



# Comtest Wireless

## Case Studies – Analysing & Troubleshooting ERTMS Systems Performance & Wayside Cybersecurity



Rail organisations are working hard around the world, to improve train performance by tackling three fundamental problems: providing greater capacity, improving service reliability and reducing signalling system renewal costs.

Traditional and analogue signalling equipment and operational procedures are being replaced with

more modern digital systems. These typically include systems based on the Europe-wide standard for train control and command systems – the European Rail Traffic Management System (ERTMS), which comprises of:

- GSM-R (rail telecommunication)
- European Train Control System (ETCS signalling)
- European Train Management Layer (payload management)

In Italy, over 700km of operational high-speed lines already run using ETCS level 2, while across Europe

many replacement and upgrade programmes have been announced and planned to be operationally implemented over the next decade. For example, in the UK, over half of Britain's analogue signalling systems with lineside 'traffic lights' controlling trains, need to be replaced within the next 10 to 15 years.

Although a digital rail programme brings many advantages including those listed in the opening paragraph, it can also bring its own challenges. This article looks at two of these challenges, using case studies.

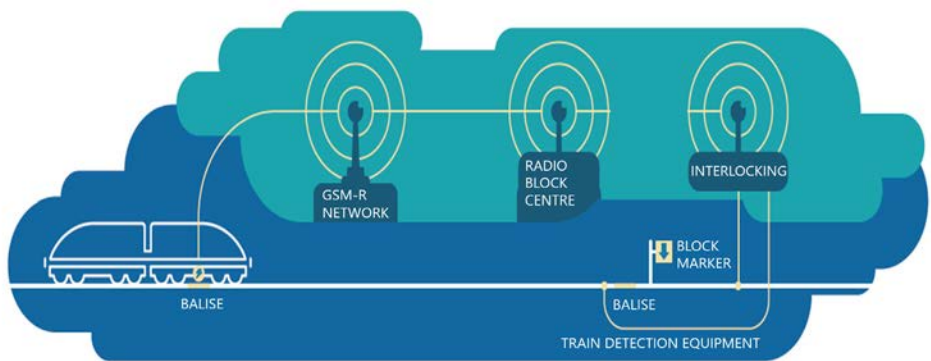
### Case Study 1 – Measuring & Monitoring Operational Performance in a Highly Complex Environment, Such as ERTMS

Digital rail relies on several highly complex systems all being in constant communication with each other, the train and the operations control centre. The critical components include the rail telecommunications network (such as GSM-R), the signalling and the interlocking systems.

Many of us have probably been subjected to ‘signalling failure’ disrupting a train journey. With digital rail, ‘signalling failure’ can occur if one or more systems fail. For example, if the train does not have a reliable stable communications connection or a clear message to proceed is not received by the train, it is obliged to stop, to meet safety requirements. This can cause delays to the rail service, leading to passenger dissatisfaction and increased operating costs and can also incur performance-related penalties.

These are just a few of the errors that can occur in critical subsystems:

- GSM-R coverage: handover, interference, transmission errors, congestion, authentication failures and equipment malfunctions
- ETCS signalling: MSC-RBC communication errors, RBC-EVC protocol stack issues, software bugs in RBC firmware, RBC-RBC interoperability problems
- Interlocking: misreading, misalignments, switch (points) issues, track occupation issues
- EVC (European vital computer) malfunction, wrong identification



It is vital that systems must work together 24/7, as well as adhere to stringent ERTMS operability requirements.

Investigation of any critical event can present a complex challenge as these very different technologies are often managed by different departments within rail organisations.

With such a diverse range of potential issues, finding the root cause of a problem can be both time-consuming and frustrating for signalling and telecoms engineers. It can also be expensive for the train operators or infrastructure providers when it comes to unplanned maintenance and penalty payments. In addition, as a GSM-R network is used considerably less than a typical mobile phone network, it is difficult to rely on statistical data to measure quality of service.

The complex rail environment requires vast numbers of data packets to be sent between the train and the signalling and interlocking systems in real-time. Ideally, this data should be collected and presented so that it provides a complete picture of each train run. When all the data from the GSM-R, signalling and interlocking systems is collected, synchronised and displayed in a single, common analytics platform, a significantly simplified view of the train run and

ERTMS diagnostics from start to finish can be provided without loss of detail.

This makes it much easier to test, monitor and troubleshoot the live environment.

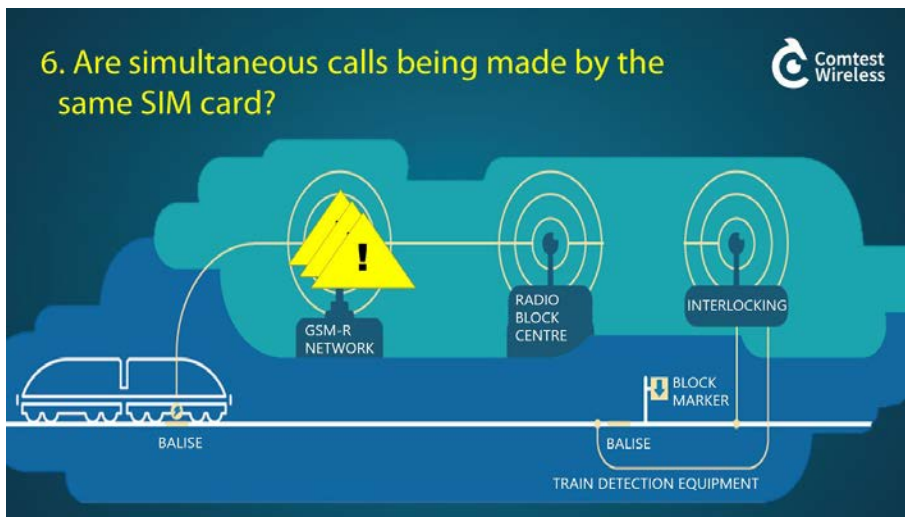
### Case Study 2 – Security Monitoring for Cyber-Attacks

Rail sector infrastructure is expected to last decades, which is one of the reasons why the sector has been relatively slow in adopting digital technology. GSM-R is a 90s design and ETCS technology is equally as old, which means that cybersecurity was not incorporated into original system designs.

In fact, the weakness of GSM-R encryption has been heavily documented. This is why cybersecurity is quickly becoming a key topic for rail network operatives.

There are many ways that the network can be vulnerable to cyber-attacks and six examples are listed below:

1. Do calls to RBCs (radio block centres) start from an unauthorised BTS?
2. Are unauthorised SIM cards making ETCS connection attempts?
3. Are trains identifying balises



run checks on network data that's already being monitored. Cyber sniffers can help network engineers to detect security and disruption issues in real-time.

They can also be used to track suspicious messages and sessions in monitored traffic and send alerts.

### What Next?

If you have found these example case studies useful, more technical detail is available in a white paper, which also includes two additional case studies on: a). "The impact of data silos with regards to troubleshooting" and b) "Budget constraints and KPIs should not rely on a 'fix on failure' approach".

To request the full white paper: 'Analysing & troubleshooting ERTMS systems performance & cyber security using case studies', please contact [shelley.robertson@comtestwireless.eu](mailto:shelley.robertson@comtestwireless.eu).

that are unknown / in unexpected locations?

4. Are ETCS level and mode changes in unexpected positions?
5. Is there a high number of call attempts to an RBC in a set period of time?
6. Are simultaneous calls being made by the same SIM card?

If the answer is 'YES' or 'I DON'T KNOW' to any of the questions in these examples, it is worth raising the alarm and/or reporting such situations and events checking for possible intrusion, attack, or other vulnerabilities.

This can be done using a cyber sniffer for example, where it can



Test, measure & monitor rail telecoms networks, signalling & interlocking systems performance with confidence

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# KLAS

## Connectivity: The Key to Unlocking Big Data in Rail

Machine Learning (ML) and Artificial Intelligence (AI) are hot topics for Big Data in rail. The value that these computer sciences offer in digital transformation is widely understood, e.g. operational efficiencies, cost savings, new revenues, and ultimately competitive advantage. However, here lies the problem: “data” – how do you put a value on it, where does it come from, and when is enough data enough?

### The Value of Data

At the start of Big Data projects, rail operators need first to define why the data is collected. With a top-level objective in mind, it is easier to understand the value behind the data and, more importantly, the

reasons for the need to secure that data.

For example, two rail use cases for Big Data could be:

1. Enhancing passenger experiences (creating additional revenue)
2. Predictive maintenance (cost savings)

The above examples highlight general purposes for data collection. Furthermore, they outline for management the justification for the business case of Big Data in rail. With a value now placed on data, rail operator IT teams can apply the computer science of AI or ML.

### Is It AI or ML?

From the two example use cases above, it's possible to outline why and when to use one or the other science or both. In use case 1, rail operators will apply AI to maximise the chances of succeeding in upselling onboard services to customers. Here, the purpose is for

the machine to think like a human and deal with unstructured data associated with human thinking.

Take an example AI application: chatbots. The chatbot can obtain information on the passenger journey. The chatbot then interacts with the passenger by suggesting movies or reading lists based on journey time. Over time, the AI refines its suggestions based on interacting with passengers, improving the overall passenger experience. Furthermore, it allows rail operators to refine their offering and reduce expenditure on unwanted content.

Whereas in use case 2, ML will be applied as there is a specific need to learn patterns with accuracy. Take the example of a metro rail car door opening. Here there is an array of structured data to collect. How many times does the door open, how long for, in what locations and under what weather conditions? The learning model ingests the data with an outcome for accurate scheduling of door

maintenance. The benefit to the rail operator is operational efficiency by eliminating unnecessary delays due to faulty doors.

## Cloud Shared Responsibility Model

With a clear vision around the need and value of the data, the next step is to understand how that data will be collected and stored. Data collection is tricky, as trains consist of multiple closed systems with no interaction between them.

Cloud providers solve some of the challenges of centralising data from disparate systems. However, rail operators need to understand that the security of accessing the cloud and protection of the data in it is their responsibility. Under the Cloud Shared Responsibility Model, cloud providers state that the security and running of the cloud is their role. The implication for the rail operator is that the safety of getting data from the edge into

the cloud and being on the cloud remains the rail operator's problem.

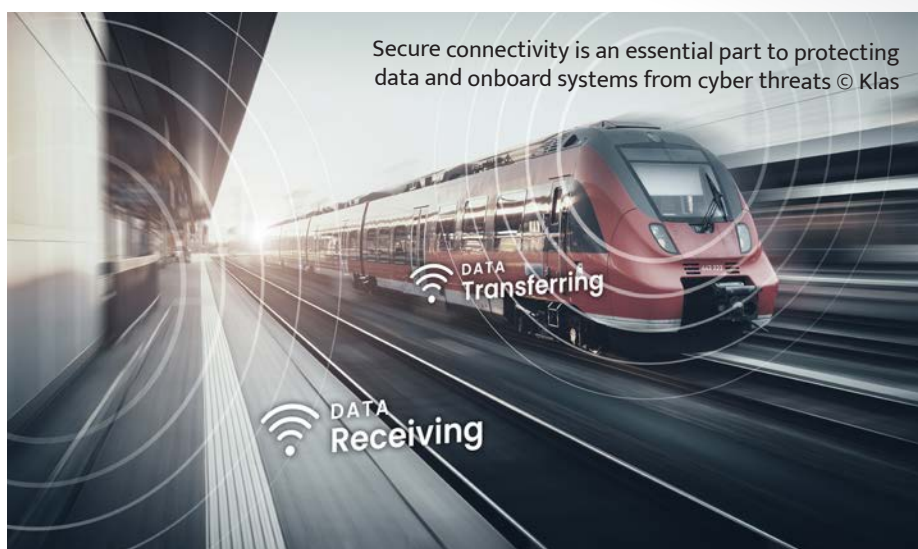
For rail operators, the question remains how do you securely get data out of trains to the cloud and keep it secure?

## The Key to Big Data Is Connectivity

The most straightforward approach

is to create a secure operational network per train. Its purpose is to aggregate the data from multiple train systems and secure connectivity to where the data is needed, i.e. the cloud or on-premise.

As most Big Data projects start as a pilot, the connectivity architecture needs to be open. For example, a rail operator may start with the predictive maintenance of door operations, connecting to



the sensors on the Multifunction Vehicle Bus (MVB). A later step could be enhanced services for conductors and drivers, which implies connecting with the ethernet and Wi-Fi network.

## Security Off the Rails

For Big Data in rail, there are two critical parts to protecting the data, when data is at rest and in motion.

The challenge for rail operations is that the data can remain on trains for long periods due to communication “not-spots” or when the train is powered off. When selecting a connectivity solution, train operators should look for a solution that offers data caching and insist that the storage disks are encrypted.

When it comes to the protection of data transmissions, the easiest and most efficient way is to look for private network connectivity. Private networks isolate the train and cloud from the cyber threats associated with public internet networks. Many rail operators are opting for Software-Defined Wide Area Network (SD-WAN) solutions. The benefit of a SD-WAN is the simplicity of management and

the encryption of data over public networks such as Mobile Network Operators (MNO).

A further advantage to SD-WAN is the ability to seed trust in the originating traffic. When it comes to accessing the cloud, identity management or trust in the data source is an essential security best practice.

## When Enough Data Is Enough

Big Data implies there is a need for vast amounts of storage. However, storage, whether in the cloud or on-premise, is costly. Therefore, there is a need to build intelligence at the edge, be it on trains or at the station platform.

Edge computing allows rail operators to apply intelligence close to the data source, enabling streamlining of the data being observed and recording only what is necessary. By running AI and ML onboard the train, the volumes of data stored externally decrease dramatically.

## In Summary

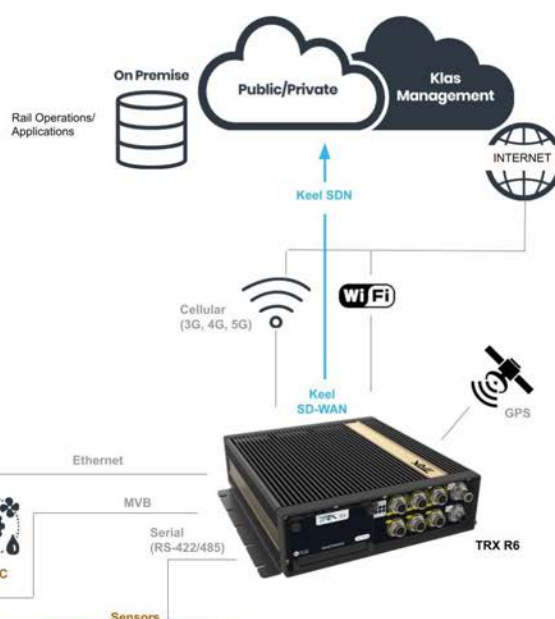
The key to unlocking Big Data in rail is connectivity. By streamlining data collection, rail operators can easily deliver predictive maintenance with Machine Learning, or enhanced passenger experiences with Artificial Intelligence.

Furthermore, security should always be at the front of any connected train and not be seen as an afterthought, especially when data is traversing public internet networks.

By choosing solutions designed for the edge, rail operators can consolidate and concentrate existing systems into a single computing platform. This in turn reduces IT expenditure and ultimately lowers the total cost of ownership for their Big Data programme.

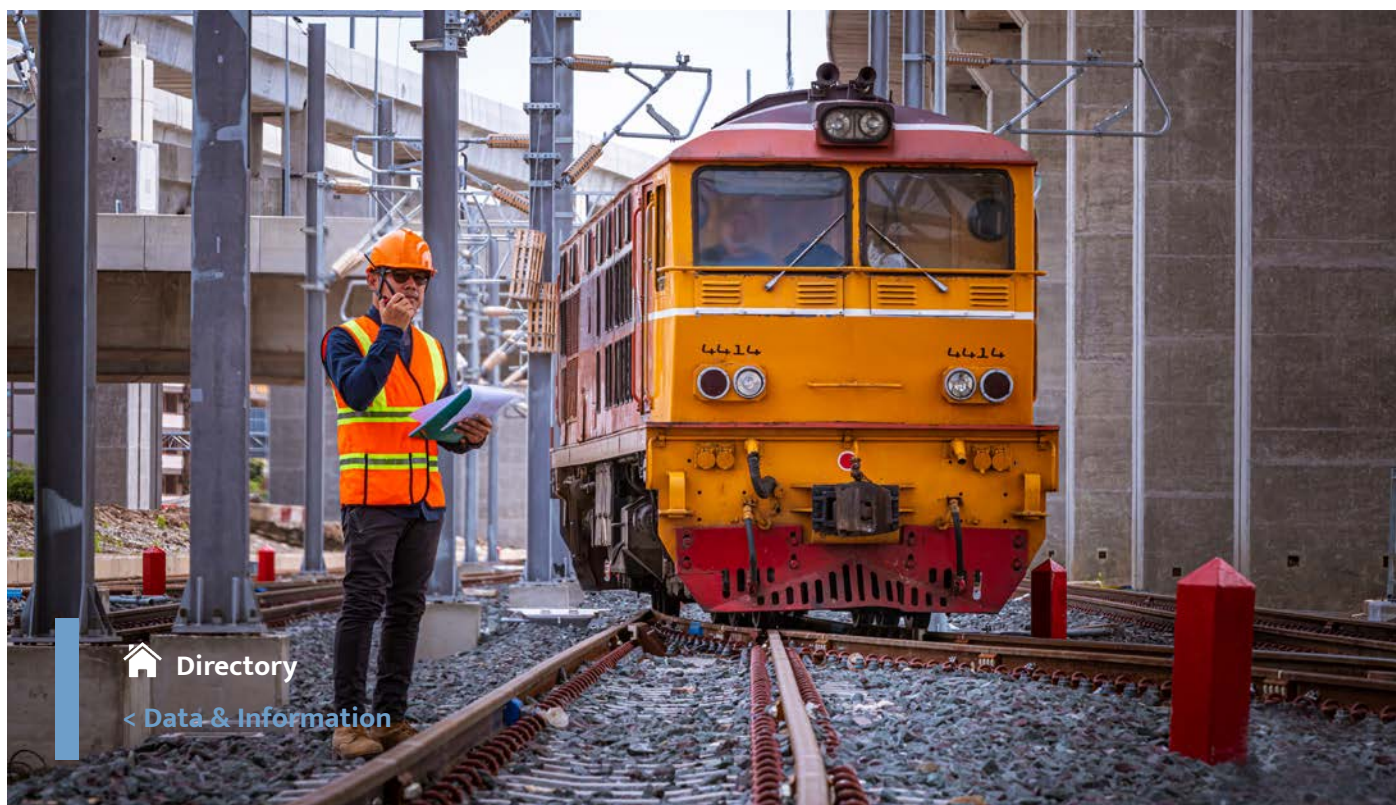
To learn more about Klas and how our solutions help deliver cyber-secure Big Data in rail, please visit <https://www.klasgroup.com>.

**TRX R6 a compute, connectivity, storage gateway. Powering AI/ML onboard with secure train-to-ground communications.**



Simplify AI/ML deployments, with open and modular architecture platforms  
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Directory

&lt; Data &amp; Information

# SINTRONES

## Sintrones Robust On-Board Computers Ensures Reliable Communication for Rail Operators

Sintrones' VBOX series of rugged computing platforms provides an all-in-one communications back-up solution for rail operators.

Taiwan-based Sintrones is an ISO 9001 and IRIS ISO/TS22163 certified producer of in-vehicle computing systems. This demonstrates

the company's commitment to continually enhancing its quality management systems and ensuring its products meet the ever-changing needs of the rail industry.

With years of engineering and product design behind it, Sintrones is renowned for its high-quality, rugged yet compact computing platforms that meet international standards including – but not limited to – EN50155 and EN50121.

EN50155 Certification Ensures Safe and Stable Operation in Challenging Conditions

By passing a series of rigorous tests to achieve EN50155 certification, customers can be assured that Sintrones' VBOX series of on-board railway computers meet rigorous vibration, shock, input voltage

range, electrical isolation, extreme temperature, humidity and EMC standards.

This guarantees that the computers are able to perform their functions safely and securely in a range of environments and conditions.

### Isolated Power Input Design Meets Class S2 Interruption Requirements

Sintron's design engineering team developed a customised power supply input feature for its in-vehicle computing systems, a critical step and a hard engineering requirement for the rail industry.

Thanks to the team's hard work, the VBOX series offers a wide input range of 24~110VDC power input with isolation, which covers almost all railway application requirements.

In addition, its power surge protection and reverse polarity voltage protection prevents system damage if the input voltage is ever accidentally reversed.

### An Operating Temperature Range of -40°C to 70°C – In Fanless Conditions

The VBOX series is also built with efficient thermal design. Testing has proven the computers can reliably operate in a wide range of temperatures from -40°C to 70°C, and even up to 85°C for short periods of time.

### Vibration and Shock Protection

Robust and reliable M12 connectors are used to enhance system stability and protection, and feature fast-locking housing to resist high-shock and vibration loads. This enables the

VBOX series to withstand vibration of up to 2.5GRMS and shock of up to 15G.

### 5G/LTE, GPS and Wi-Fi Functionality – An All-in-One Communications Solution

To ensure the safety of passengers and staff, railway operators require a reliable communication solution. In response to their needs, Sintron's VBOX series has been developed to support 5G/LTE wireless, GPS and Wi-Fi functionality.

Whenever the primary wireless communication encounters instabilities or interference, the LTE wireless module can jump into action, providing the perfect back-up solution, even in challenging



Alert System



Announcement System



4~8ch Video Input Camera



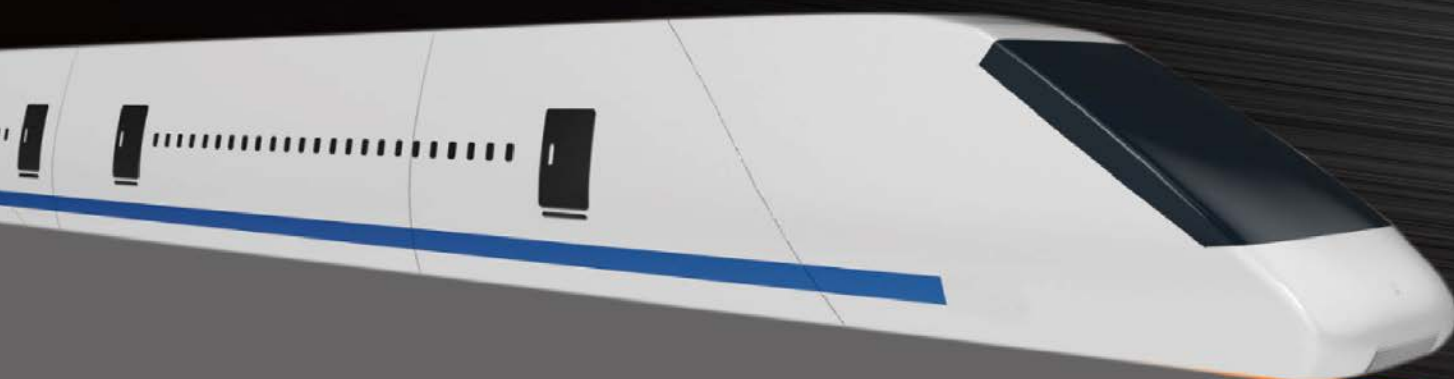
Passenger 22" Display for Digital Signage



LED message board



Isolated I/O



environments such as rail tunnels and mountainous areas where wireless signals can be weak.

GPS enables real-time location tracking of the train to the control centre and railway workers, while the computers' Wi-Fi capabilities enable the uploading or downloading of data much quicker when approaching or in Wi-Fi enabled train stations or depots.

## Italia Rail Chooses Sintrones' Computers for Its Wireless Communication Back-Up System

Italia Rail wanted to implement a new wireless communications back-up system to ensure the

safety of maintenance workers who spend much of their time working alongside its high-speed rail tracks.

The rail operator was looking for a solution that met industry standards as well as its own wireless communication (the need for LTE, GPS and Wi-Fi all in one) and power supply input requirements.

Sintrones VBOX series was chosen due to the company's ability to provide a customised supply input design, to satisfy the project's wireless communication requirements and the fact that its product range met EN51055 certification standards.

The company's VBOX-3620-M12X computing solution was implemented and installed on Italia Rail's rolling stock back in 2018 with no network interruption, and has

enhanced the efficiency of both the operator's wireless network communication and the safety of its trackside workers.

### Flexible Configurations and Customisation Services

Sintrones understands the bespoke needs of rail operators and with the support of its experienced R&D team, can cover a flexible configuration service, and provide tailor-made systems or boards to meet your specific requirements.

If you'd like to find out more about Sintrones and its VBOX series of rugged in-vehicle computing solutions please visit

[www.sintroncorp.com](http://www.sintroncorp.com) or email [sales@sintroncorp.com](mailto:sales@sintroncorp.com).



# Railway Application

Dual Ethernet for Video Streaming & Diagnosis



Communication Port



Battery backup



GPS



LTE



Bluetooth



WLAN



Smart Power Management  
9~36V DC Input



# Intelligent Transportation Systems

Certified Fanless Computer

- AI GPU Fanless Rolling Stock Computer
- Intel Gen 10 Comet Lake + Nvidia GPU
- Certified EN50155 Rolling Stock Standard



## ABOX-5210-M12X

ABOX-5210-M12X is specifically designed for railway rolling stock applications that guarantee reliable performance, withstanding environmental disturbances such as severe shock and vibration in railway vehicle applications. It features 8 x M12 X Coded Connectors for GbE and certified Rolling Stock EN 50155 & EN 50121-3-2 that cater to rolling stock's application including traffic safety systems, passenger information systems, broadcasting systems as well as surveillance systems and so on.



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