Railway-News

The latest news & reviews from the industry

Railway-News

M A G A Z I N E

Six Tracks - The Industry's New Directions in a Changing World p.6

&

In the News. . . p.10

ISSUE ONE 2022

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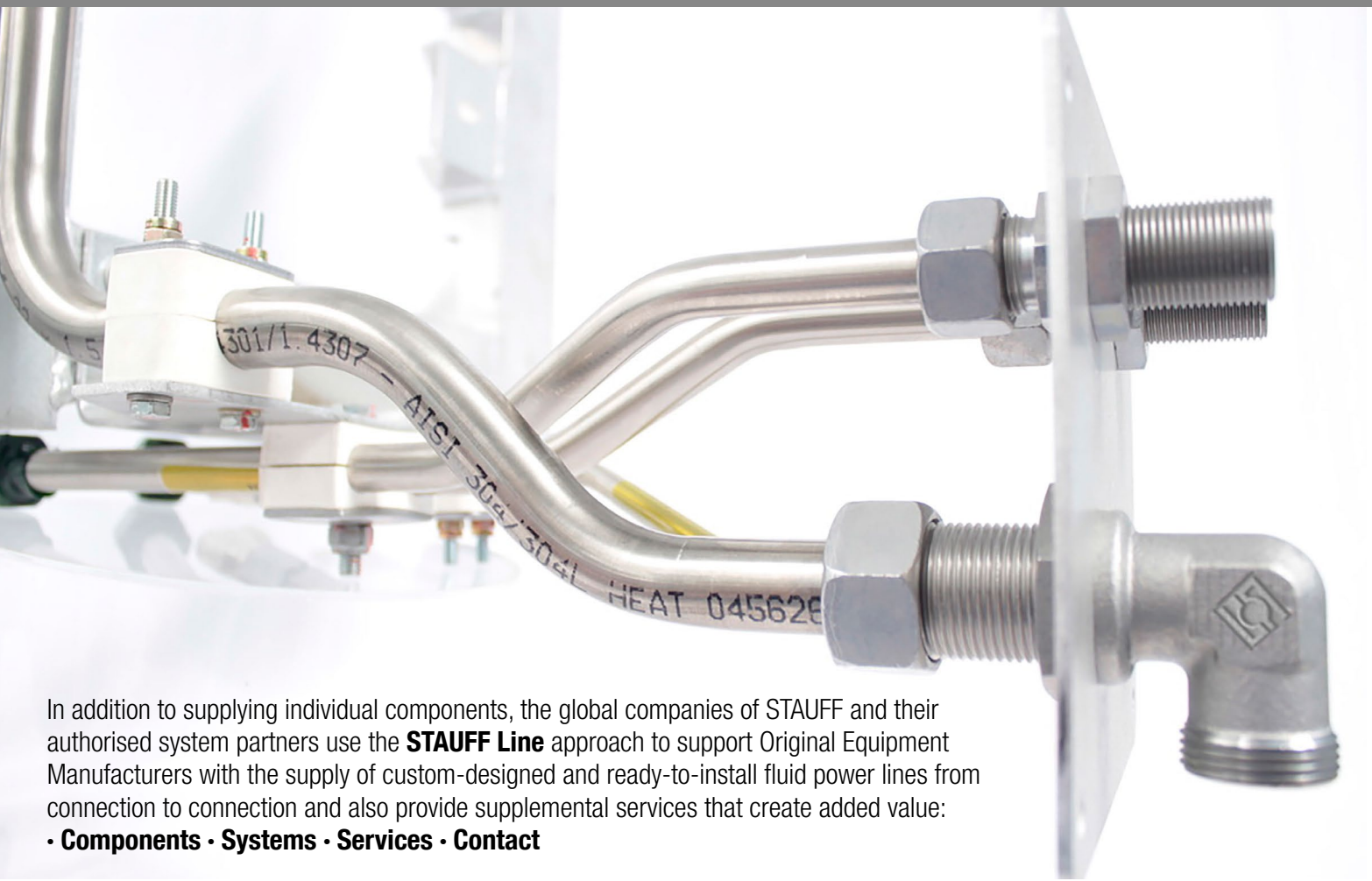

In addition to supplying individual components, the global companies of STAUFF and their authorised system partners use the **STAUFF Line** approach to support Original Equipment Manufacturers with the supply of custom-designed and ready-to-install fluid power lines from connection to connection and also provide supplemental services that create added value:
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Letter from the Editor

Dear Readers,

It's now 2022 and at the time of writing all remaining legal restrictions relating to the coronavirus pandemic have been removed in England. This means that anyone who tests positive is no longer legally required to self-isolate if they test positive for the virus. This is part of the UK government's Living with Covid plan, following the prime minister's assessment that the virus is here to stay and that the response therefore must be for the country to "transition back to normality".

This is good news for the rail sector, both in terms of passenger numbers and for the supply chain, with workers becoming more available.

Just prior to the change in the regulations, National Rail passenger numbers reached a high of 74% in February compared to pre-pandemic levels and 80% for the Tube network. In both cases these highs are weekend figures. Weekday figures reached a February high of 73% for National Rail passenger numbers and 64% for the Tube network.

At the same time there are also reduced timetables across Britain's rail network. These schedules were implemented on 16 January amid staff shortages caused by employees having to self-isolate after testing positive. It will be interesting to see how service levels and passenger numbers will change with the prime minister's Living with Covid plan.

Transport for London (TfL) remains in trouble, living hand to mouth as it were, teetering on the brink of bankruptcy and forced to operate on the basis of many short-term funding deals agreed with the Department for Transport (DfT). TfL's funding woes are rooted in the decline in passenger numbers coupled with the government's requirement that TfL pays for itself with ticket sales.

Of course, covid is not the only thing affecting our railways. Britain was recently pummelled by storms Eunice and Franklin. These caused damage and flooding to the rail network.

It is not all bad news, however. 2022 is the year the central section of Crossrail is finally set to open.

You can read more about all of these stories in our In the News feature on p.10.

We will publish our second issue of 2022 on 1 June. Receive it straight to your inbox by signing up to our mailing list **here**.

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@a2bglobalmedia.com** or +44 7432 725001.

If you enjoy our website and magazine, you might also be interested in our sister sites – **Bus-News**, **Future Transport-News** and **Airport Industry-News**.

Please enjoy our first issue of 2022!

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COVER: Crossrail trains in Old Oak Common © Crossrail Ltd

POWERLINES GROUP

Powerlines Group

System supplier for rail electrification

Issue One 2022

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Features

Six Tracks – The Industry's New Directions in a Changing World

By Aytek Yuksel, Content Marketing Leader – Power Systems

The transportation sector is a pillar of the modern world. It moves people and goods, powers economic growth and a more equitable global society. Cummins understands that rail is a critical component of this eco-system.

But the quest for sustainability is reshaping the industry and achieving fundamental change is no easy task. It involves critical decision-making, committed investment and pioneering technology.

As the rail industry considers its tomorrow, we look at the direction of travel – the tracks that rail is on.

Track 1: Connectivity

Connectivity has the power to bring technologies together. IoT assets generate essential data. AI makes sense of it. Machine learning leads the execution of tasks. Connectivity unites them and amplifies the value of them all.

5G connectivity means more reliability and lower latency. For the rail industry, this means the number of IoT devices on locomotives can grow without congesting the wavelengths. Mission-critical tasks requiring instant intervention can now be handled through connected devices.

Locomotives are getting increasingly connected, and the emergence of 5G will further fuel the use of connectivity across the rail world.

Track 2: Diversification of Power Systems

In the 1800s, steam powered rail. In the 1930s, diesel became the preferred method. More recently, diesel-electric and full-

electric have shared much of the locomotive power market space.

Now, new technologies are emerging. Fuel cells, both solid oxide and proton-exchange membrane, batteries and hybrid solutions are all on rail's radar. As rail operators take the necessary steps towards their zero emissions future, it seems inevitable that rail will be powered by a more diverse set of technologies than ever before. Operators are likely to pick and choose the right power system technology based on infrastructure availability, local regulations, economic feasibility and the preferences of their customers.

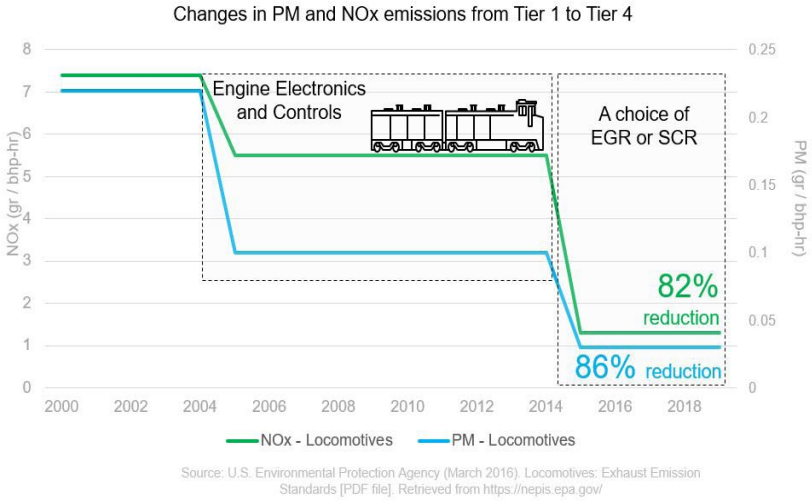
Diesel-electric and full-electric will co-exist with emerging technologies, such as fuel cells and batteries, often through hybrid applications.

Track 3: Towards the All-Renewable Future

Most energy-using sectors share an all-renewable future. That requires lowering the emissions of leading power system technologies. Emissions of nitrous oxides and particulate matter of diesel engines have decreased over 80 percent over the last two decades. Technologies such as selective catalytic reduction (SCR) and exhaust gas recirculation (EGR) enabled this significantly reduced environmental footprint.

Decreasing emissions will continue to drive change. In the rail industry's near future, diesel-hybrid and fuel cell applications will take the lead. In 2020, two trains powered by Cummins Inc. fuel cells completed an 18-month, 180,000km trial in Europe. By 2022, 41 Cummins fuel cell-powered trains will be operating in Europe, making Cummins the leading provider of fuel cells for trains globally.

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



Source: U.S. Environmental Protection Agency (March 2016). Locomotives: Exhaust Emission Standards [PDF file]. Retrieved from https://nepis.epa.gov/

Track 4: Urbanisation

A third of the world's population lived in urban areas just a few decades ago. Today, more than half do.

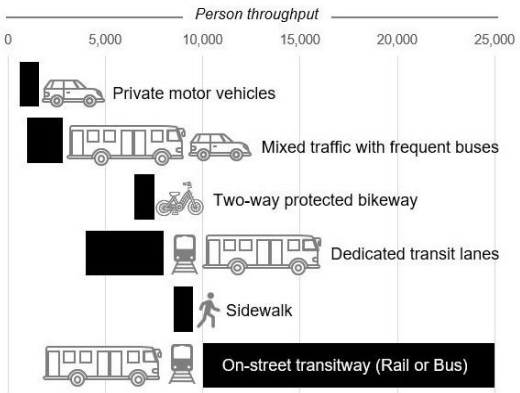
People move to urban areas to prosper, find better jobs, and improve their access to education and health services. However, urbanisation throws up challenges, particularly for urban transportation, which must battle congestion and environmental impact.

Emerging technologies and advancements in connectivity will lead the way – including in the next generation of trains.

Innovations such as renewable fuels, sensors and IoT devices point to a future of autonomous operation, increased safety and a reducing carbon footprint. Rail continues to offer the highest capacity per hour to serve people's travel needs in a transitway setting.

Urbanisation is expected to increase the demand for rail transportation within and across urban areas.

The capacity of a single lane by modes of transportation



Source: National Association of City Transportation Officials. (n.d.). Transit Street Design Guide. Retrieved from https://nacto.org/

Moving people in urban areas with different modes of transportation

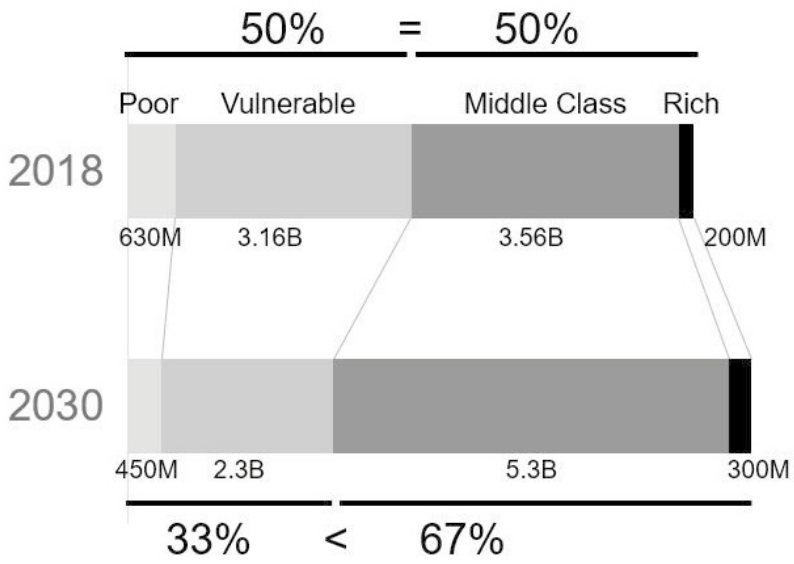
Track 5: The Global 'Middle Class'

2018 was the first year that 50 percent of the world's population had enough discretionary spending to be considered "middle class" or "rich" (according to The Brookings Institution).

A growing middle class means an increasing global population with higher purchasing power, directly increasing trade activity and traffic of goods.

With today's long and complex supply chains, transportation is a direct beneficiary of middle-class expansion, and trains have long been a critical component of the transportation ecosystem that facilitates freight movement.

The continued expansion of the middle class is expected to fuel the growth in the rail industry worldwide.



Source: Hamel, K., Kharas, H. The Brookings Institution. (September 2018). A global tipping point: Half the world is now middle class or wealthier. Retrieved from https://www.brookings.edu/

Middle class to dominate demographics by 2030

Track 6: Lower Emissions Transportation

Seventy-five percent of the respondents to a PEW Research Center survey were particularly concerned about helping the environment.

Inevitably, transportation is at the heart of environmental conversations, everywhere from international forums to dinner tables. The sector produces 15 percent of manmade greenhouse gas emissions globally, secondly to the electricity and heat sectors. Rail has long been considered as one of the most environmentally friendly modes of transportation, both for goods and people. It is estimated that rail moves 40 percent of freight measured in ton-miles but is responsible for only 8 percent of freight transportation carbon emissions.

From this advantaged position, rail continues to reduce its environmental footprint. Electric trains produce zero carbon emissions when the electricity is produced renewably. And as we have seen, hybrid solutions incorporating hydrogen fuel cells will make a growing sustainability contribution. The Coradia iLint, the first passenger train powered solely by Cummins hydrogen fuel cells and producing zero emissions at the point of use, is operating today.

Rail has a bright future in a digital and decarbonising world.

Cummins is working to keep the industry ahead of the curve.

AHEAD OF THE CURVE.

Partner with an advanced engine company whose reach stretches around the world. With Cummins, you gain the strength of a true global powerhouse, already at work in 190 countries and some of the world's most advanced rail companies. Our worldwide network of 8,000 distributer and dealer locations means parts and service are never far from wherever you are. Trust the legendary expertise, performance and global leadership of Cummins to keep you at the front of the line.

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ALWAYS ON

In the News...

TfL Receives Further Bailouts

Transport for London continues to live somewhat hand-to-mouth, given the ongoing reduced passenger numbers as well as the government's insistence that it fund itself through ticket sales. Now the government and Transport for London have agreed a funding extension (the Fourth Funding Package) that will continue until 24 June 2022. It comprises an Extraordinary Support Grant of 200m GBP. The government has also said it would 'top up' TfL's revenues should they be lower than a pre-determined passenger revenue forecast and require TfL to pay back any excess should the actual revenue be better than the forecast. These funds come with strings attached: TfL has until 31 March to show how it can achieve a further 400m GBP in either cost savings or additional revenue in 2022/23 in addition to delivering on the previously agreed operating cost savings for the 2021/22 financial year. London's Transport Commissioner Andy Byford said that *"There is no UK recovery from the pandemic without a London recovery and there is no London recovery without a properly funded transport network in the capital"*.

Crossrail Is Due to Open

One good thing that is to happen in the rail industry in the UK in 2022 is the opening of Crossrail – at last. The date for this is still set to be in the first half of 2022. Trial operations are underway – they began on 20 November 2021 – and these are the final stage of opening the line to passengers between Paddington and Abbey Wood. As part of these trial operations, more than 150 scenarios are being tested. These trial operations take several months. It is only once it is clear that services can run safely and reliably that a specific opening date will be announced. MTR is the operator of the Elizabeth line.

The RAIB Publishes Its Interim Report on the Salisbury Tunnel Junction Collision

The Rail Accident Investigation Branch (RAIB) published its interim report on the Salisbury Tunnel Junction collision that took place on 31 October 2021. A 3-car SWR DMU struck a GWR train comprising two 2-car DMUs after passing a signal at danger. The report noted that the preceding weather of significant rainfall and heavy winds contributed to the problem. The train was travelling at permitted speeds and the driver responded appropriately. However, as a result of wheel slide because of leaves on the line, the SWR train continued moving past the signal, colliding into the side of the GWR train.

The RAIB examined the railhead


rm damage on the Cambrian Line © Network Rail

around the collision site and found crushed leaves on the track. As part of Network Rail's protocol to manage the risks associated with low adhesion, the standard was to run two railhead treatment trains on the route to ensure all tracks were treated at least once every 24 hours. However, planned engineering works meant the treatment train did not run and there was a 32-hour gap between treatments when the collision occurred.

Storms Eunice/Franklin Cause Disruption

Storms Eunice and Franklin caused widespread disruption to the rail network in February after gale force winds of up to 100mph hit. Services were suspended during the storms as well as in the aftermath to allow for the necessary clean-up. The Cambrian line for example became flooded and will likely remain closed for several weeks while Network Rail engineers repair the damage.

Rotherham Central station had to close after Storm Franklin caused flooding. Engineers spent three days pumping water away. Engineers have also been busy clearing fallen trees and other debris from lines around the country. Ensuring the rail network is capable of dealing with an increasingly volatile climate is key.

Northern Line Shut for 17 Weeks

The Northern line, one of London's busiest Tube lines, closed between Kennington and Moorgate (the Bank branch) on 15 January and will only re-open in mid-May. The works taking place are part of the Bank Station Upgrade Programme.

TfL says that Bank and Monument stations are the third-busiest interchange on the London Underground network, seeing 120 million passengers annually in a normal year. The works are set to increase capacity at Bank station by 40 percent.

In addition to new lifts and escalators as well as a new station entrance in Cannon Street, TfL will connect a newly built tunnel that will run southbound Northern line services and stop at a new Northern line platform. The existing platform, meanwhile, will be converted into a passenger concourse.

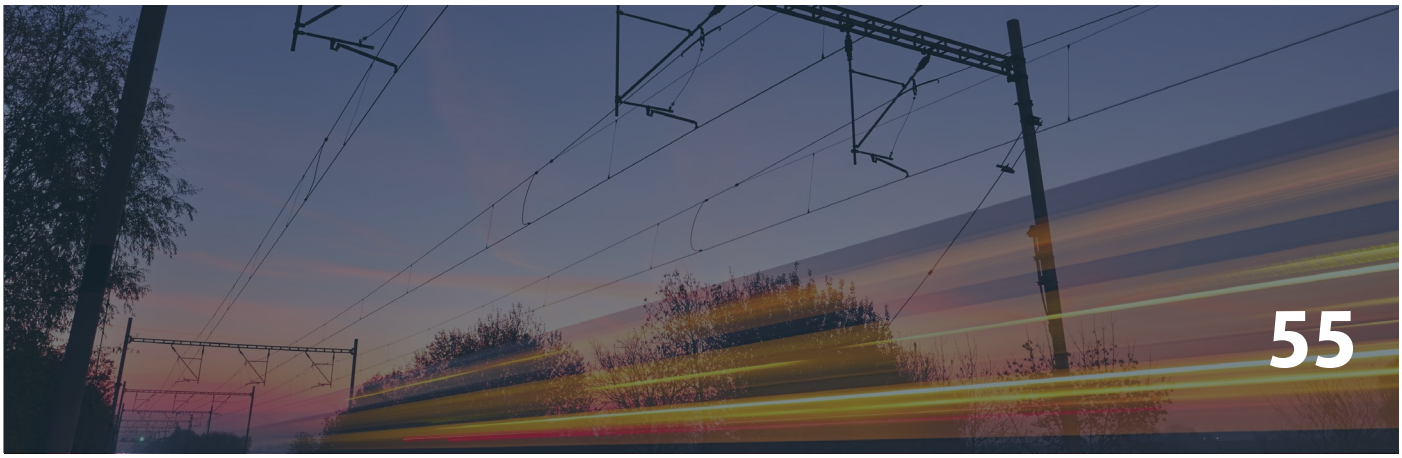
The interchange between the Northern line, DLR and Central line will be improved.

During the closure, TfL will excavate the final sections of tunnel at either end of Bank station. It will also install the final sections of new track. It is also during this closure that TfL is converting the existing platform into a passenger concourse.

Tunnelling for this project began in 2017.

The new Elizabeth line Paddington station © Crossrail Ltd

Directory



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Data & Information

Televic GSP

COSAMIRA Technology: Improving Fleet Reliability with Continuous Monitoring

Data Analysis: The Future of Rail Maintenance

Condition-based maintenance is the key to reducing fleet maintenance costs, improving reliability, reducing unexpected failures and maximising passenger satisfaction. Based on sensor data, a condition-based maintenance solution gives you the ability to understand the condition of all of your assets and use trend analysis and predictive algorithms to get the very most use out of every piece of equipment and repair it in a streamlined, planned way.

Conduct Work When It's Needed – Not When It's Planned

This ability ensures that you obtain the maximum lifetime from every component. In the rail industry, many items are often replaced earlier than required and as a result the entire industry replaces parts that may have only reached 70% of their usable lifetime.

Key components such as wheel bearings are now designed to last much longer than before. Advances in bearing grease for example now reduce rolling resistance under load to an unprecedented degree. Metallurgical advancements have led to steel alloys that increase wheel life and mitigate both flats and profile wear.

Thanks to condition-based maintenance, you can gain insights into the wear characteristics of all bogie elements, track their wear patterns and establish an ideal repair time window. Get the very most out of your components and cut costs in the process.

Repair It before It Fails

This ability falls on the opposite end of the wear spectrum calculation. It's used to predict the unexpected failure of a key component which can lead to train downtime and massive resulting costs. When a train unexpectedly fails it's necessary to find a replacement train, refund passengers, deal with service delays and a loss of trust and handle disruptions to previously planned maintenance work. Components that fail before their time are always an expensive problem for rail operators.

Condition-based maintenance offers the opportunity to prevent these costs through early detection of likely failure. Sensors monitor all systems at all times under real-time conditions. Analytics are capable of identifying reasons for failure and provide warnings to other trains where similar faults can be prevented.

Prior Preparation Prevents Poor Performance

Simply knowing that a part is reaching end of life is only one element of success; preparation is the key to a seamless, economical maintenance and repair cycle.

Pre-positioning equipment and reserving material and personnel drives down costs and cuts train downtime. When staff know what's coming up next, what they need to handle the job and the exact steps they need to follow, efficiency gains and cost reductions quickly accumulate. In addition, spare parts can be ordered under 'just in time' provisions, reducing the amount of capital (and space) committed to unnecessary parts in the warehouse.

How to Achieve This?

Get a complete integrated solution for condition-based maintenance on all types of trains encompassing sensors, hardware, analytical software and dashboards with the latest technology provided by COSAMIRA from Televic GSP. With over twenty-five years of experience in the design and production of bogie-mounted control and monitoring systems and worldwide references: Televic GSP is the right partner for you.

For a safer, highly-efficient and cost-effective fleet

COSAMIRA:
your 360° bogie control and monitoring system

Reduce maintenance costs through early detection of likely failure with predictive analytics

Improve reliability by monitoring the real-time operational condition of your trains and tracks

Maximize passenger experience by measuring passenger comfort, tilting and active radial steering

Today, over 60,000 vehicles are equipped with Televic GSP solutions. For more than 30 years, we've been a leading and trusted partner for railway operators and train builders all over the world.

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Olympus

Facilitating Proactive Maintenance of Railway Assets with Videoscope Inspection

Railway transportation is faster and more connected than ever. To maintain safety and uptime, it is imperative to regularly check for flaws and defects in railway systems.

Olympus IPLEX™ videoscopes are widely used by the railway industry around the globe. IPLEX videoscopes assist inspectors and inspection service providers with their remote visual inspection needs during initial development, manufacturing, maintenance and the repair of railway vehicles and infrastructure. An IPLEX videoscope is a reliable and efficient visual inspection solution for many railway industry applications, including gearboxes, hollow axles, horizontal shafts, motors, bogie side frames, tracks, pillow cushions, shock absorber springs, railway infrastructures and air-conditioning systems.

Adding an IPLEX videoscope to your railway inspection toolbox provides numerous benefits, including:

- On-site internal visual inspection without costly strip down and disassembly
- Longer periods between scheduled inspections
- Accurate planning and scheduling of maintenance activities
- Condition monitoring and recording of internal components throughout the

asset life cycle
- Improved predictive maintenance planning, including the need for parts, specialised tools, and skilled workers

IPLEX™ videoscopes have an array of specialised features that enhance many applications:

Innovative Imaging

For more detailed inspections in large, expansive spaces, the IPLEX GX/GT videoscope's LED light source is 30% brighter than its predecessor (the IPLEX RX videoscope).

Clear View in Oily Environments

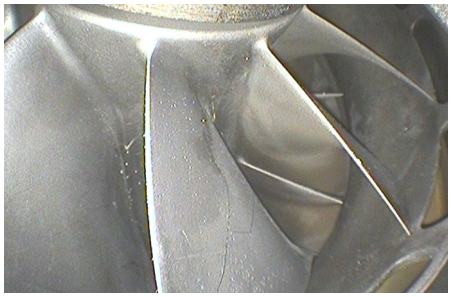
An innovative oil-clearing tip adaptor features grooves that use capillary action to draw oil away from the lens, maintaining clear images without having to stop inspections and retract the scope to wipe oil off the lens.

One Tool, Many Jobs

Change between white and ultraviolet light sources and interchangeable scopes with a variety of diameters and lengths to suit a wide range of inspection applications.

Easy to Use

A touchscreen and hot key controls enable easy operation. A multiple-position function enables you to position the screen where it's comfortable for you. The



IPLEX GX/GT videoscope

IPLEX RX/RT videoscope (predecessor)

display features bright and clear images with smart video.

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Stay on Track with Proactive Railway Maintenance

IPLEX GX/GT – All on Board for Fast, Effective Railway Inspection

Railway transportation is faster and more connected than ever, but to maintain safety and uptime, it is imperative to regularly check for flaws and defects in railway systems.

The IPLEX GX/GT videoscope is a tough, reliable, and efficient visual inspection solution that has everything for a wide range of railway inspection tasks including gearboxes, hollow axles, horizontal shafts, motors, bogie side frames, tracks, pillow cushions, shock absorber springs, railway infrastructures, and air conditioning systems. Add an easy-to-use IPLEX GX/GT to your railway inspection toolbox today to immediately benefit from:

- **Onsite internal visual inspection without costly strip down and disassembly**
- **Accurate maintenance planning and scheduling with longer periods between inspections**
- **Condition monitoring and recording of internal components throughout the asset life cycle**

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Rail Vision

AI's Role in Improving Rail Safety and Maintenance

Rail Vision is revolutionising railway safety and maintenance. Using the latest artificial intelligence (AI), deep learning and sensor technology, this Israel-based technology provider has developed state-of-the-art solutions that lower the risk of accident, unplanned downtime and maintenance costs through advanced obstacle classification technology.

Bursting into the market in 2016, **Rail Vision** has launched advanced safety systems developed specifically for mainline, shunting yard and light rail environments. These can be engineered to provide a system that meets each customer's specific needs.

Created by Leading Technologists

Rail Vision's CEO Shahar Hania has been with the company from the start. With experience working in optical engineering, systems engineering, electro-optics and deep learning technologies across the communication, defence and train industries, he started Rail Vision as a passion project with his three fellow co-founders.

Their evenings and weekends were spent developing a rail-specific obstacle detection and classification system, while also approaching potential investors. Interest in the technology was high, and it wasn't long before they had the financing they needed and became the first company to bring such a solution to the industry.

AI Unlocks New Capabilities and Benefits

Hania first took on the role of Head of Technology Research and Development (R&D), only later stepping into the position of CEO. His focus was on optimising Rail Vision's technology, and it was his decision to embrace AI.

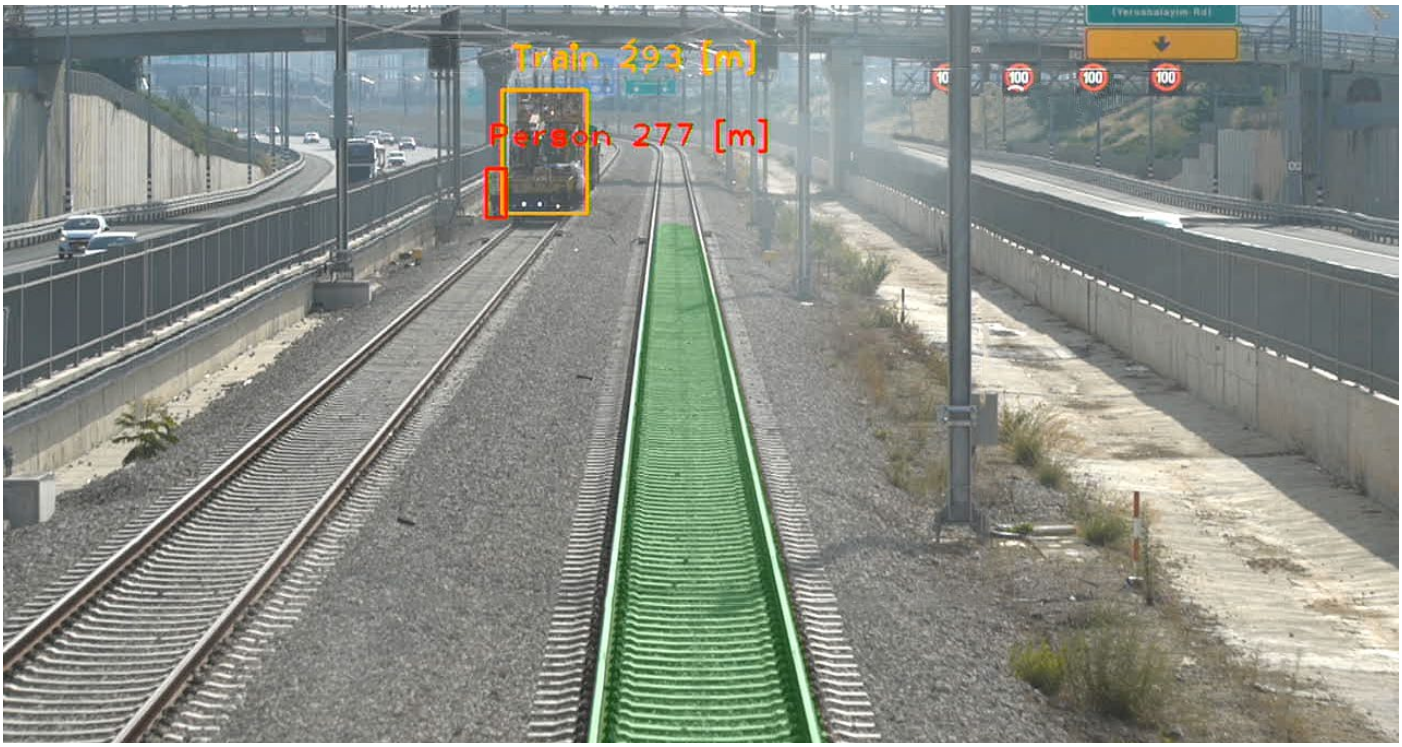
Shahar Hania, CEO of Rail Vision

"I was familiar with computer vision and knew its capabilities – and limitations. I could see that AI was the only technology that could do what we wanted," he explains.

This is because, unlike computer vision, AI has the ability to imitate intelligent human behaviour and enables machines to process information and make decisions based on logic and reasoning. Taking into account a broader set of factors, it can determine the best-possible outcome based on the input it receives.

World First Technology

AI, paired with electro-optic sensors and deep learning, is what enables Rail Vision's solutions to detect and classify obstacles such as people up to 1.5km ahead, while



trains and cars can be classified 2km ahead.

Monitoring a predefined area of interest, the system generates real-time visual and audio alerts for both the train operator and the command-and-control centre, and is, to date, the only system that can detect and classify a person at risk in time to avoid a collision.

Systems have been developed not only for **mainline** environments, but also to streamline and enhance the safety of shunting operations.

Similarly to the mainline system, Rail Vision's **shunting yard system** detects and classifies objects on and around tracks, ensuring safety in what is a busy environment. Monitoring operational dead zones also enables safe and secure wagon coupling with the company's one-of-a-kind pathfinder technology that detects switch states.

Big Data Services

Rail Vision's monitoring systems can be customised to meet customers' specific needs, as can its **big data service add-on**.

This analysis of railway infrastructure and surrounding ecosystems, through GIS mapping, allows ongoing infrastructure inspection, environmental trend analysis and image-based navigation.

Tailored reports are provided that support predictive maintenance, enhancing resource planning and quality assurance.

"By collecting and analysing big data you don't have to wait until there's a problem. You can monitor a situation and plan your maintenance ahead of time," Hania explains.

"Take vegetation penetrating the track, for example. You can monitor growth to know when it will need to be cut back. Long-term monitoring enables you to learn specifically where vegetation is an issue, and you can make adjustments to where you send maintenance teams. This saves time and money.

"Another example is pantograph and catenary monitoring and analysis. This will enable you to predict when problems will occur and prevent them, providing savings in terms of costs and downtime," he points out.

Benefits of Rail Vision's Advanced System Capabilities

Rail Vision's advanced system capabilities offer rail companies a myriad of benefits.

Analysts report that condition-based and predictive maintenance can provide combined efficiency gains of 15–25% and that

predictive maintenance alone can lead to up to a 10% savings in maintenance costs.

The latter equates to possible annual savings of three billion euros (3.37bn USD) for rail operators, 2bn euros (2.24bn USD) for third parties, and 1bn euros (1.12bn USD) for rolling stock OEMs.

Add to this the priceless lives saved thanks to avoiding a collision or derailment and the benefits are clear to see.

"Just think, every time there's an accident there are costs – these may take the form of human casualties, money, infrastructure or unplanned downtime. Our system has already been proven to reduce these by avoiding accidents and optimising predictive maintenance," says Hania.

"By preventing just one collision or derailment you've gone far beyond a return on investment."

Discover How Rail Vision Could Help You

As a young, agile technology firm, and the first to bring this technology to market, Rail Vision continues to be a pioneer in the field of rail safety and maintenance.

Always looking for new challenges to solve, the team has been working on a number of innovative solutions including an autonomous braking demonstration with Swiss Federal Railway's Cargo subsidiary (SBBC).

This is currently in the final stage of an operational field test on an SBBC locomotive in Switzerland, and operators from across Europe have been coming to view the solution in action.

Keen to keep pushing the envelope, Rail Vision would love to hear from like-minded rail companies.

Why not **get in touch** to see how Rail Vision's technology could benefit your business?

Rail Vision
INTELLIGENCE ON TRACK

MAIN LINE SYSTEM
Combining the power of computer vision and advanced electro-optics sensors to improve the safety of trains. Detection and classification of obstacles up to 2000 meters on and along rail tracks under all weather and light conditions.

SWITCH YARD SYSTEM
Real time obstacle detection with visual and acoustic alerts to insure ongoing operation and maximizing efficiency. Enabling remote operation of shunting locomotive matching the future automated shunting yard.

railvision.io **T:** +972(0)9-9577706 **E:** marketing@railvision.io

Rail Vision
INTELLIGENCE ON TRACK

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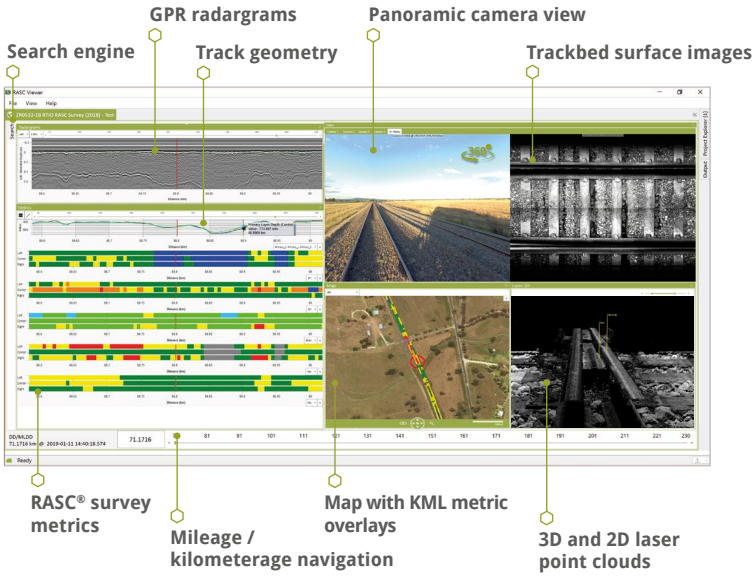
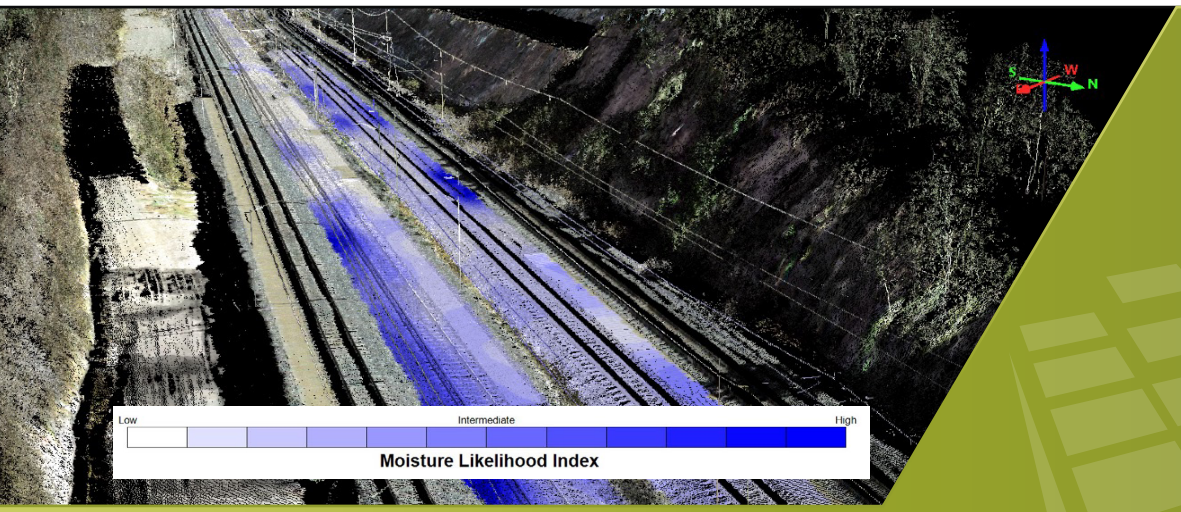
Above- and below-ground trackbed inspection for condition-based maintenance planning.

Zetica are leading providers of train- and hi rail-mounted trackbed inspection and asset mapping RASC® services in Asia, Australasia, North and South America, Europe and Africa, combining **GPR**, **trackbed surface imaging**, **360º LiDAR**, **3D laser** and **panoramic video** to address…

- **Fouled ballast**
- **Mud holes and drainage problems**
- **Ballast pocket occurrence and growth**
- **Formation renewal decision support**
- **Sleeper damage and missing fasteners**
- **Root cause analysis of track geometry defects**
- **Work order recommendations**
- **Quality control of trackbed maintenance**





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SKF Railway

More Effective Maintenance of Sydney's Railway with Condition Monitoring from SKF

A long-term test of two SKF condition-monitoring solutions in Sydney's passenger rail fleet has shown encouraging results. With more knowledge about the condition of components, it is possible to move away from time- and distance-based maintenance, boosting uptime and availability.

Sydney is Australia's largest city as well as one of the nation's fastest-growing urban areas. Operated by government agency Sydney Trains, the 800-kilometre-long passenger rail network's eight core lines are used for close to 400 million rail journeys each year.

The job of maintaining the bulk of the Sydney passenger rail rolling stock is undertaken by engineering business Downer Rail & Transit Systems.

Time- and Distance-Based Maintenance

Downer has traditionally structured its maintenance programmes around time- and distance-based models. Components in the trains are replaced once they approach the end of the lifespan recommended by the OEM. However, with passenger journeys trending upwards, Frank Lukacevic, senior mechanical engineer, Downer and Christian Douglas, Downer's asset strategy manager, have been tasked with finding new ways to reduce downtime and safely extend component use.

Trial of Condition-Monitoring Systems

So, when SKF approached Downer in 2020 with two rail condition-monitoring systems that had been successfully deployed elsewhere in the world, they were naturally curious. They agreed to trial the technologies.

The first system, SKF Insight Rail, is a wireless, self-powered system for monitoring the condition of bearings in passenger rail bogies. Fitted to the axlebox, it gathers vibration and temperature data and uses a cellular data connection to send updates to a user interface.

SKF's IMx-Rail, meanwhile, is a more sophisticated, multi-channel system for the condition monitoring of a wide range of assets such as wheelset bearings, wheels, gearboxes, and traction motors. Data is continuously uploaded to the SKF cloud and analysed in a remote diagnostics centre. Customers receive alerts from the diagnostics team and can view key data through an easy-to-use interface.

Wealth of Data

After more than a year of trials, the two systems have delivered encouraging results. In particular, the Downer team has been extremely impressed with the quality of the data being delivered

by the IMx system, which, they say, has greatly broadened their knowledge of how components age and degrade.

"Acoustic trackside systems monitor wheel bearings, but we were previously blind to what was happening with the traction motors and gearbox," says Lukacevic. *"With IMx-Rail, we have been able to pick up on some gear mesh faults in our gearboxes and monitor how they have changed over time. If we learn that the fault is degrading very slowly over time, then we might gain the confidence to say in future that a gearbox can run for some time like this without action being taken."*

Track Shock Setection

As well as extremely high-quality data and analysis, another major benefit to Downer of IMx-Rail has been the shock-detection capability. Because the system is continuously taking and transmitting data, it can identify locations where track damage may be present.

"Everywhere the train goes we can map the network and identify vibration hot spots, which is something we've never been able to do before," says Douglas. *"In turn, we are able to go to the network operators and tell them what we'd seen. It strengthens that relationship and is quite a value-add."*

Early Fault Detection

Getting the most out of the Insight system on the Sydney network has initially been more challenging, but there has also been encouraging success. For example, Insight successfully detected a wheel bearing fault nearly two weeks before it was detected by trackside sensors along the network.

Lukacevic says such early warning has the potential to be a powerful tool moving forward. *"Being able to pick things up earlier gives us more time to plan in maintenance,"* he says. *"That, in turn, means we can do the work without impacting other activities or having sets parked up and not available for service."*

Bright Future

Both Lukacevic and Douglas agree that condition monitoring is the future of passenger rail maintenance.

"Condition-based monitoring is the future because of the benefits in terms of efficiency and competitiveness," says Douglas. *"If you're not needing to replace components as quickly, you're using fewer resources and less electricity and saving money and time."*

SKF's speed and vibration sensor mounted on axlebox

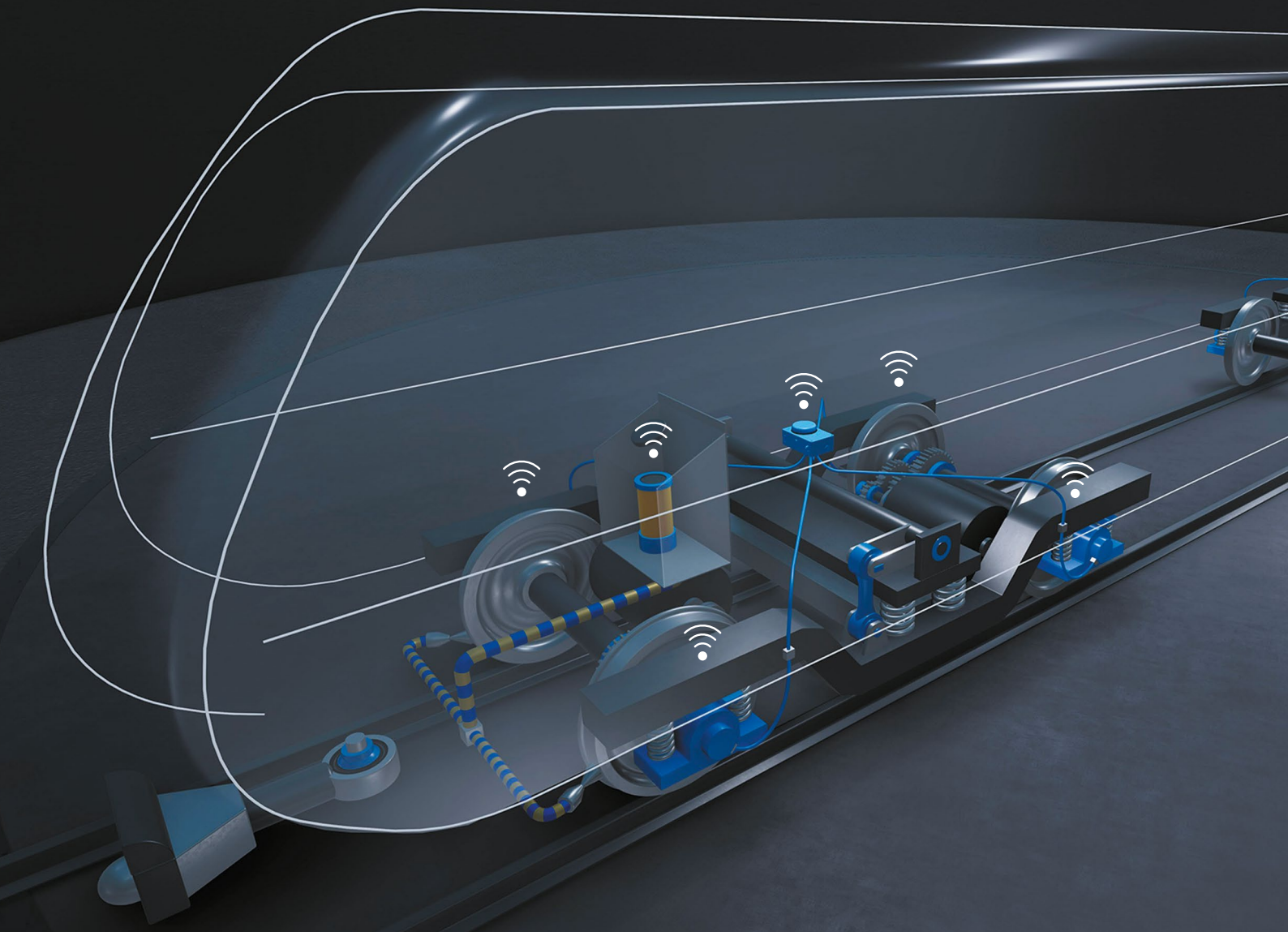
SKF's advanced multilog on-line system IMx-Rail for increased rail traffic reliability

SKF®

This article was first published in Evolution, the Technology Magazine from SKF.

Time for the next chapter.

Base your maintenance on better insights.



Maintenance protocols for rail operations are traditionally structured around fixed intervals. As components approach the end of their lifespan, they're often replaced according to the manufacturer's manual.

What if better insights into the state of your rotating equipment could help to safely run longer maintenance intervals – leveraging SKF's unique expertise?

Explore our offers in predictive maintenance and find out how the right data can help you boost uptime and performance while reducing waste and emissions.

SKF®

NEXTSENSE

Digitalisation of Wheel Profile Measurement in Freight Transport

GE Relies on Optical Measurement Technology from NEXTSENSE to Break New Ground in Wheel Profile Wear Measurement

For more than 30 years, the name IGE has been a household name in the European railway scene, and now the Internationale Gesellschaft für Eisenbahnverkehr is also one of the pioneers in modern analysis tools. Using NEXTSENSE optical measurement technology, it is replacing outdated wheel profile measurement instruments with new ones. User-independent measured values, more accurate results and operation at the touch of a button are a source of great enthusiasm among the workforce.

As one of the few private rail transport companies in Germany, IGE offers a wide range of services in the rail sector. Whether goods transport, special transport or tourist nostalgia train journeys, the operator takes its guests and above all its goods wherever there are railways in Europe. Day in, day out, it has to deal with numerous foreign wagons that are loaded to the brim over Europe's rails. There is no question that the subject of security is very important here. Each wagon is carefully inspected by trained wagon masters before departure, with special attention paid to the wheels. This process takes two to three hours, depending on the length of the train and the condition of the wagons. Only wagons that pass this inspection will have their papers handed over to the train drivers for departure. If, however, there are defects of an operationally dangerous nature, the wagon will be parked and further action will be decided with the vehicle owner.

Stefan Gärditz, railway operations manager at IGE with responsibility for vehicle safety, summarises: *"The quality of the wagons is already very high, but there is still a risk that a train may not leave due to a lack of safety. We can only detect these defects and take the wagon out of service at an early stage if we carefully examine the wear and tear of the train wheels."*

Measurement of the Wheel Flange

To date, the wear of the individual train wheels has been checked manually with a calliper. The wagon master goes under the wagon and manually places the calliper on the wheel. As a rule, the wheel flange is measured; in cases of doubt, the experienced wagon master can also determine the hollow tread of the running surfaces with the naked eye.

"However, this manual method carries the risk of obtaining different results depending on who carries out the measurement. Time pressure and incorrect handling when using the calliper are the two most frequent sources of error," Gärditz describes the current situation.

With this approach, a certain continuity and comparability of results are almost impossible. In addition, manual measuring with the calliper is a physical strain that should not be ignored, especially for the older generation of wagon masters.

Figure 1: Stefan Gärditz in action with CALIPRI Prime

Figure 2: Contact-free measurement of the wheel profile

Figure 3: Colour-coded measured variables on the sensor

User-Independent Measurement Results

Dissatisfied with this situation, Gärditz became aware of NEXTSENSE's optical measuring instruments, which are based on a patented advanced development of laser light section technology. An algorithm corrects tilting and twisting of the measuring instrument, resulting in the same measurement result being obtained regardless of the respective user.

"I saw and tested NEXTSENSE's measuring instruments for the first time at a trade fair. It was immediately clear to me that we needed something like this at IGE. That's what I've always been looking for," says Gärditz

In particular, the CALIPRI Prime, a laser-based handheld measuring device guarantees user-independent measured values in the micrometre range when testing wheel flange wear (Figure 1). Within a few seconds, the camera/laser unit in the measuring device records the flange profile (flange height, flange thickness, qR size) of the wheelset. There is no need for any contact with the wheel profile, so there is no danger of tilted contact as is the case with conventional gauges (Figure 2). Depending on necessity, the wheel width, the hollow tread and rollover can also be determined and limit value violations can be colour-coded. Immediately after the measurement, the measured variables are displayed on the handy sensor and are available for digital transfer to a computer (Figure 3). As part of the Nextsense product portfolio, CALIPRI Prime is the attractive entry-level model that offers all the advantages of optical measurement technology at a surprisingly moderate price.

Gärditz confirms that the introduction of a digital measuring device and doing away with old methods did not lead to resistance among the workforce: *"We haven't had any acceptance problems, even with our older colleagues the device has been received with enthusiasm. It's simply a great relief, be it because of the fast measurement at the push of a button, the much higher accuracy or simply the great physical relief of not having to climb under the vehicle anymore. But the best thing is that it even triggered a certain hunting instinct,"* laughs Gärditz. *"My colleagues are now using CALIPRI Prime to review their own assessment of profile wear. They check their own results. If the work is fun, then we've done everything right."*

Versatile Fields of Application

Even though the main purpose is the random profile measurement of freight wagons, IGE uses the handy measuring device in a variety of ways, for example, in training courses for wagon masters.

"There is always great amazement at the hundredths of a millimetre accurate measured values on the wheel flange," says Gärditz happily. Or in nostalgic train rides with the historic rail vehicles: *"During a ride like this, I recently had a case of a passenger wagon wobbling. At the next station, I took the measuring device out of my pocket and measured the wheel flange wear. In this way, we could quickly see that the wheels were fine and the problem was somewhere else,"* says Gärditz.

Paperless Future Prospects

IGE, which is growing rapidly, has a clear goal in mind: in the near future, each wagon master should be equipped with his own CALIPRI Prime, so that according to Gärditz "the error-prone manual measuring" can be avoided completely. His vision is that not a single sheet of paper will be needed for the entire documentation. In his imagination, each wheel should be assigned its own barcode, whereupon the individual measured values are transmitted digitally to the vehicle owner immediately after measurement. Apart from saving a considerable amount of time, this would probably prevent many sources of error from arising in the first place.

Looking at the product developments at NEXTSENSE, it can be said that his vision may soon become a reality. The company is already working on various software solutions to make handwritten documentation superfluous. With an app and a smartphone, for example, the measurement plan can already be managed today and data for identifying the vehicle, axle and wheel can be entered directly on the track (Figures 4 and 5). It will be interesting to see where the digitalisation of the maintenance of the wheel-rail system will take us.

Figure 4: Easy operation with smartphone and app

Figure 5: View of the wheel profile as point curve

Click or scan the QR code to find out more about NEXSENSE

HEXAGON | NEXTSENSE

Sintrones

Data and Information Systems Usher in the Era of the Smart Railway

The global rail industry has long needed modernisation and system upgrades.

Legacy equipment and networks strain under the pressure of increased demand for capacity, in addition to changing expectations and regulations from passengers, industry associations and governments alike.

Challenges continue unabated. The industry is working towards more sustainable practices, which, for example, involve electrifying lines, searching for ways to improve energy efficiency and conservation, and investing in new greener solutions such as hydrogen-powered trains.

Then there's the rise of digitalisation. Passengers now expect reliable connectivity when they travel, in addition to technical solutions that improve their customer experience – from real-time updates on the status of their journey through to hands-free payment options.

Uptake of the latter was accelerated by the arrival of Covid-19, the impact of which rocked the global railway industry. As people were told to avoid crowded spaces and keep

contact to a minimum, interest in smart solutions grew as the sector looked for new ways to keep passengers safe while ensuring services continued to run smoothly.

Technology's Driving the Future of the Rail Industry

All these factors have led to the emergence of the smart railway system.

Smart railways use the latest technologies – such as 5G, edge computing, Internet of Things (IoT), big data, cloud computing, analytics, artificial intelligence (AI), machine learning (ML) and global positioning systems (GPS) – to improve safety and quality of service.

This technology is used to manage rail operations more efficiently by sharing data across rail infrastructure components. Today's smart railway solutions include, but aren't limited to:

- Passenger information
- Safety and security monitoring
- Rail communication
- Real-time geolocation tracking
- Smart ticketing
- Rail and freight operations management

Sintrones' In-Vehicle Computing Systems

Sintrones is a leading supplier of onboard computers for the rail sector. The company's rugged in-vehicle computing systems meet the rigorous EN50155 requirements for vibration, shock, input voltage range, electrical isolation and extreme temperature, humidity and EMC. This ensures its solutions provide safe and stable operation in harsh environments such as high-speed trains.

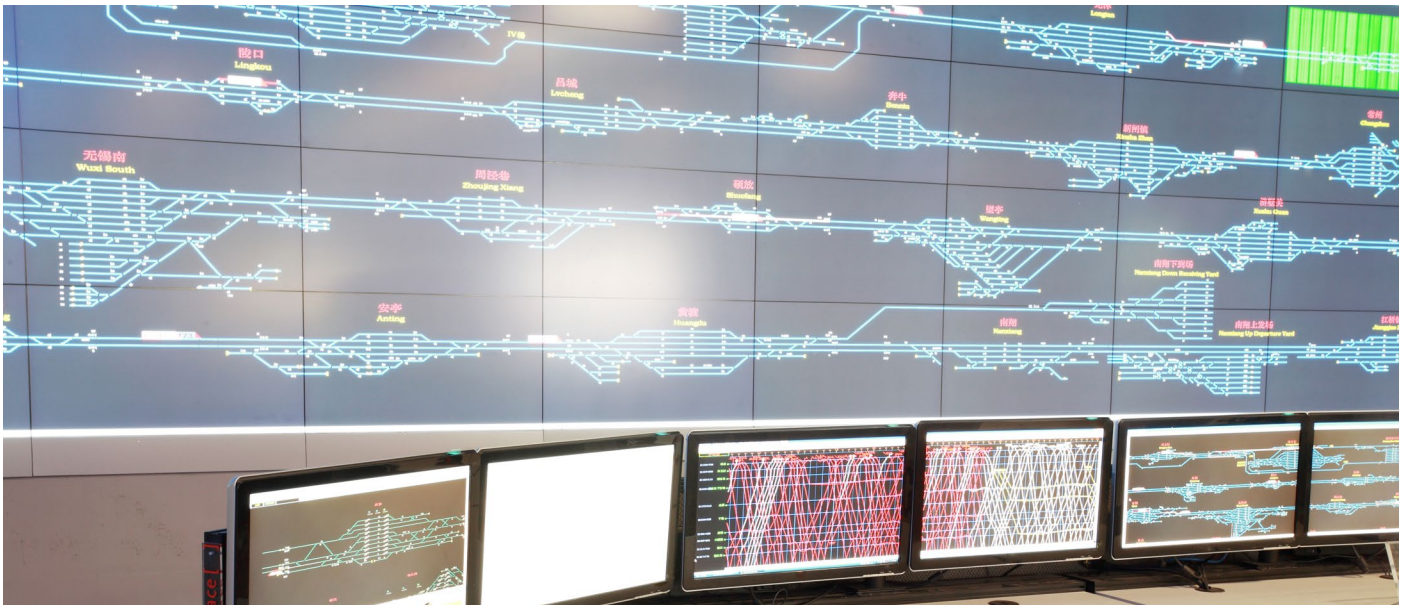
Sintrones understands the bespoke needs of rail operators and with the support of its experienced R&D team, provides a flexible configuration service and offers tailor-made systems that meet specific requirements.

Bespoke Design

Take Polish train manufacturer PESA Bydgoszcz SA, which had some specific requirements when looking to upgrade its on-board computers. Requisite capabilities included isolated digital I/O design to protect against environmental noise and transient signals and ensure system reliability, and on-board network video recorder (NVR) functionality that could provide real-time recording, analysis and tracking.

PESA also wanted the computer to be able to connect with a wifi router in order to provide a reliable on-board internet service to passengers, in addition to functioning as the on-board display control system.

In response, **Sintrones designed a custom-made, next-generation VBOX-3600-ISO-embedded**



system that met PESA's exact requirements, with the manufacturer ordering over 1,000 units.

Wireless Communications Back-Up System

Another example comes from **Italia Rail**, which wanted to implement a new wireless communications back-up system to ensure the safety of maintenance workers spending time working alongside high-speed rail tracks. Sintrones was chosen due to the company's ability to provide a customised supply input design and satisfy the project's wireless communication requirements.

Its VBOX-3620-M12X in-vehicle computer was installed on Italia Rail's rolling stock, enhancing the efficiency of the operator's wireless network communication and the safety of its track-side workers.

Rail Safety Computing Solutions

Sintrones' solutions also improve safety. After an incident between a high-rail vehicle (road-rail vehicle) and moving train highlighted the weaknesses of its existing high-rail limits compliance system, one American freight railroad company knew it must upgrade its existing solution. This needed to have a reliable authority limiter that couldn't be disabled by users, guaranteeing that vehicles could only travel where they were safely authorised to do so.

This required a bespoke computing solution that would seamlessly integrate with the company's existing software and equipment, consolidating into a single hardware platform that would meet its specific needs – the **ABOX-5210 fanless box computer**.

Mobile Computing Solutions

Think Big, Think IoV

Smart Railway Computer Solutions

Telematics for Transportation Security and Efficiency, Plus Passenger Satisfaction

This evolution drives the need of embedded computer in having high performance, longevity and reliability, fitting perfectly with railway environments. NEXCOM offers train PC featuring AI-powered, 5G NR, Wi-Fi 6E wireless connectivity, anti-shock design, metal dust proof ability, stable & wide range power supply, industrial-grade reliability and extended product life cycle.

nROK Series

- Railway Computers – EN50155
- Intel Atom®/8th/9th Gen Core™/Xeon® CPU
- Fanless and rugged design
- 5G/LTE, Wi-Fi, BT, CAN, GPS + DR, PoE, and multi-SIM integration
- Optional isolated 24~110VDC power input
- AI applications with add-on GPU cards
- EN50155 & EN45545-2 certifications

VTC 1911-IPK

nROK 1020

nROK 6222

nROK 7252

nROK 6221

nROK 7251

vROK Series

- 10.4-inch all in one railway open frame panel computer – EN50155

vROK 3030

aROK Series

- Advanced AI Computers with GPU – EN50155
- Intel® 8th/9th Gen Core™/Xeon® CPU
- Designed for AI applications: driver assistance, track obstacle/intrusion detection, track maintenance, video analytics
- Selected NVIDIA GPU, Google TPU, and Hailo AI modules add-ons
- 5G/LTE, Wi-Fi, BT, CAN, GPS + DR, PoE, and multi-SIM integration
- EN50155 & EN45545-2 certifications

TAIWAN EXCELLENCE 2022

aROK 5510

aROK 8110

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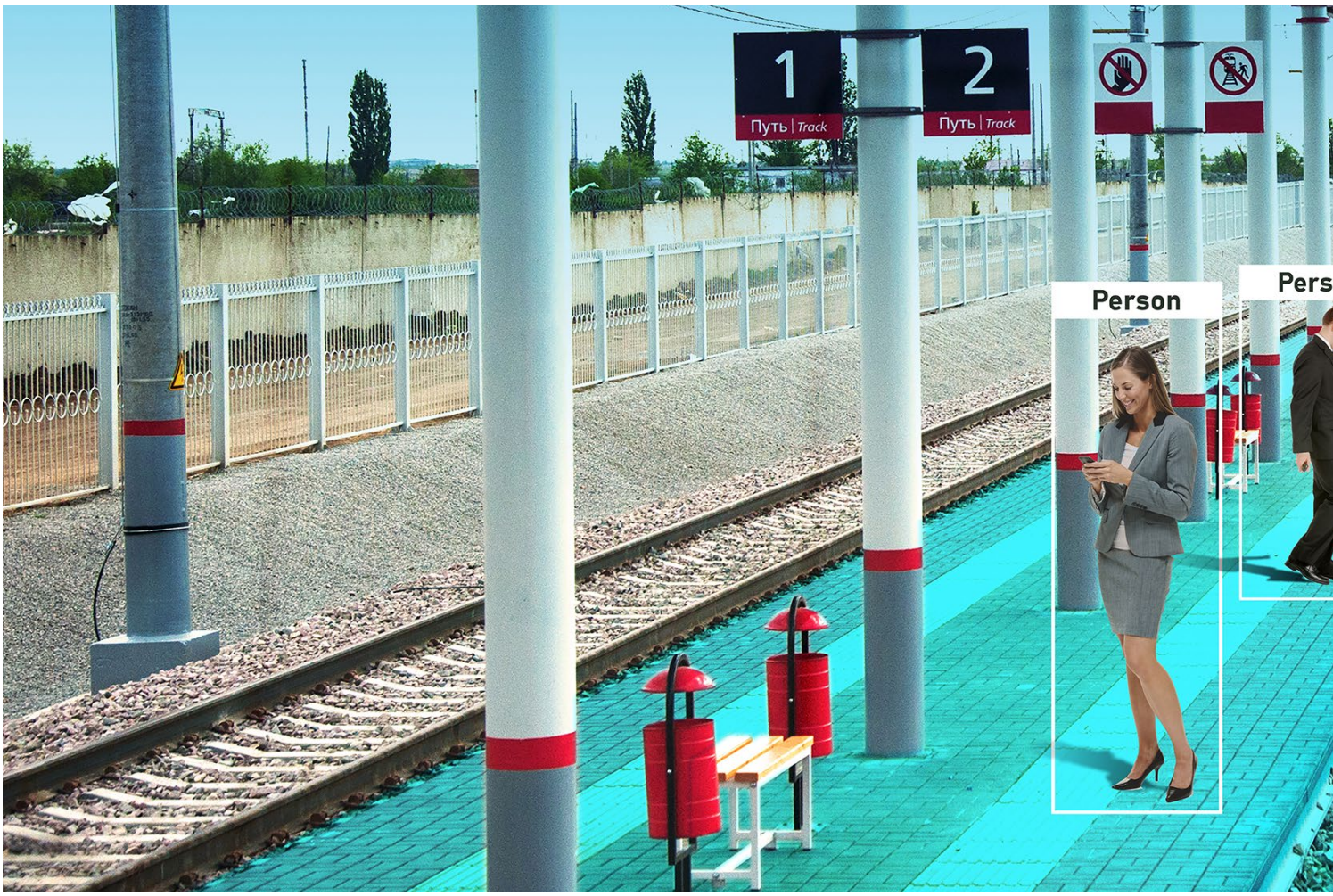
intel partner Titanium

NEXCOM

AI Computing and Intelligent Surveillance – NEXCOM's Key to Railway Revolution

The swift and relentless advances in computing, including artificial intelligence (AI) and advanced video data analytics, have already been delivering benefits to many businesses and society.

The rail industry is no exception in wishing to exploit these advances. However, railway operators are constantly struggling to meet their passengers high expectations and challenges are present for such technology to be implemented on to the railway system.



The Demand

On-train computing solutions are required for a broad range of application areas, including: train security, safety & operational management, train telematics & asset monitoring, passenger infotainment, driver advisory support, and train communication infrastructure.

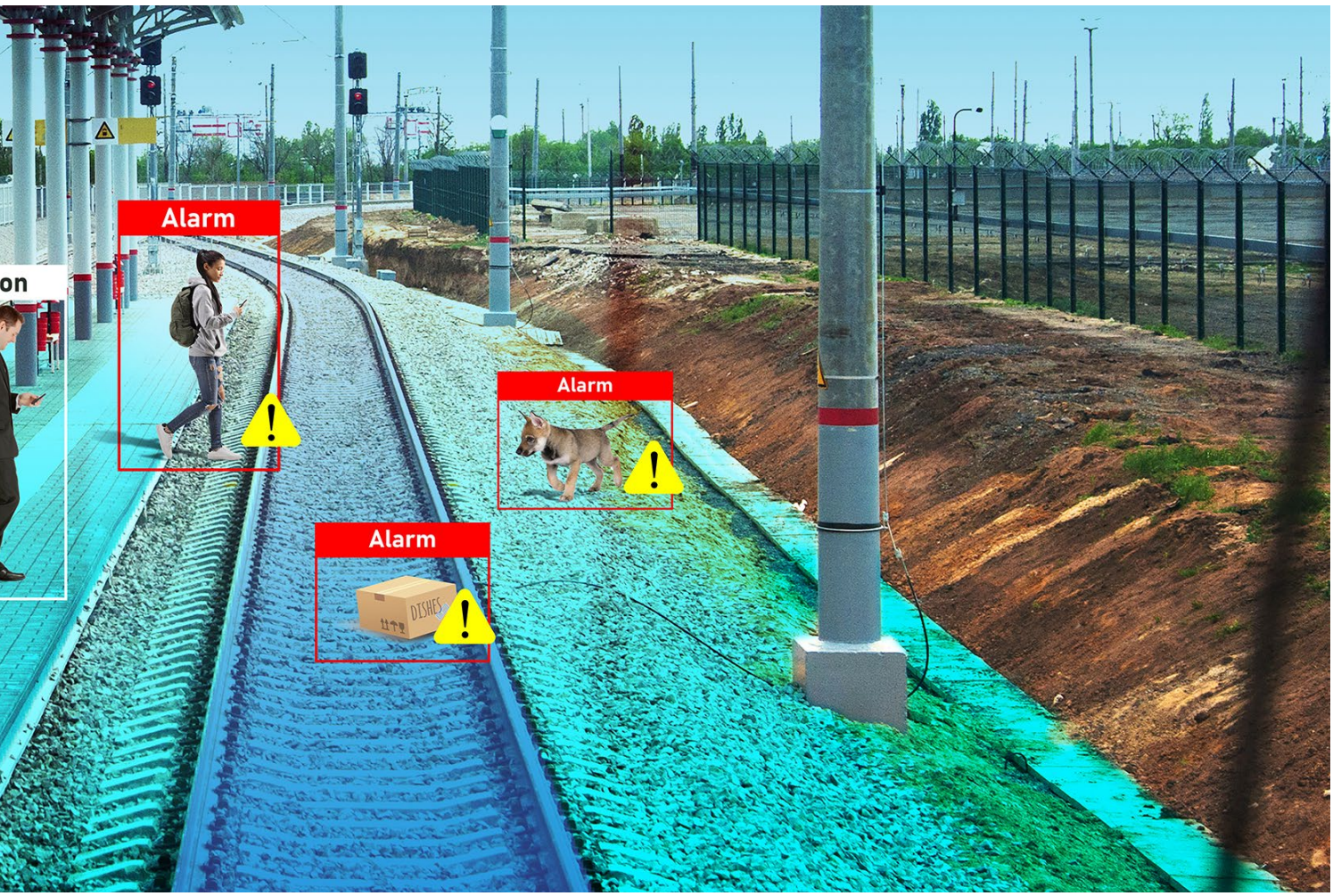
These applications encompass video recording and analytics solutions for passenger/luggage security, seat occupancy, COVID-19 mask wearing compliance, people counting, door clearance, and the adoption of AI-based analytics for scene analysis and facial recognition. In addition, there are train forward-facing applications consisting of: video & LIDAR analytics for monitoring signal light adherence, detecting track obstructions, flooding alert, vegetation ingress assessments, and rail-side/bridge damage detection. To further ensure everyone's safety, there is also an option in providing platform approach surveillance – alerting any platform incidents prior to the train arriving at the platform on to the display of the train's cabin.

High-performance mobile access hubs would be providing wifi access and multiple 5G/LTE communication channels to the internet while on the move. It will support high-throughput on-train networks, including up to 10GbE LAN port with multiple PoE connections to PoE cameras, PoE displays, and intelligent antenna or sensors.

The On-Train Challenge

The computing platforms supporting such on-train applications are required to meet the strict criteria of EMC, operating temperature ranges, shock, vibration, and power input performance that the rail industry has defined for any electronic equipment installed on rolling stock. Moreover, equipment manufacturers are required to obtain several rail standards, including EN50155, EN45545-2, and many others.

To complicate things further, supply voltages of 24, 48, 72, 96 and 110VDC are used on rolling stock. In spite of any power interruptions of up to 10ms, output of the system's power



supply should be continuously delivered.

Other challenges include physical constraints, with limited cabinet space, meaning the size of the computing equipment is heavily restricted. Thus, the installation needs to be carefully planned as operating temperature may be affected by tight shared enclosures among other electrical equipment.

Edge computing is significant when it comes to efficient data communication rates. For instance, instead of embracing a cloud-based service, data could be processed and stored more efficiently through the collaboration of AI and camera, where data storage and analytics are carried out locally on the train.

These platforms are usually expected to run unattended and may often need remote system management support. Thus, for safety and reliability measures, operators will prefer fanless systems with IP ratings.

The Solutions

NEXCOM is a global leader in the design and manufacture of mobile computing platforms in Taiwan. The company is known to have a long and strong track record for manufacturing a wide range of high-quality systems, fulfilling requirements for most of the above applications while maintaining strict compliance with rolling stock regulations and standards. System range is continually being extended to keep abreast of the latest technical advances in computer technology, bringing benefits for on-train applications.
Examples include the compact entry level nROK 1020-A and VTC 1910-IPK systems paired with low power consumption, Intel Atom® CPUs, for general purpose use.
In addition, there is the nROK 622x series with Intel Atom® x7-E3950, providing configuration flexibility for cost-effective video surveillance, analytics, storage, and communications solutions.

Whereas, the nROK 7251 / nROK 7252 series is based on the powerful Intel 9th generation and Xeon® CPUs. It has up to 64GB RAM and up to four user-accessible storage bays for large data storage requirements. Moreover, there are eight PoE ports, 5G ready, and BOM optional to support up to four LTE/5G modules with eight SIM cards, maximising connectivity and throughput. Additional options for AI accelerator modules are also available. The nROK 725x series supports a full range of power input standards from 24VDC through 110VDC PSUs.

Finally, the latest vROK 3030 10.4-inch all-in-one railway open frame panel computer, is designed for human machine interface (HMI) and passenger information system applications. It implements the latest Intel Atom® x6414RE processor for both Windows and Linux platforms, with the ability to support analogue camera x 4 or PoE camera x 2 (optional) for security purposes. Its LCD panel offering 1,200nits guarantees sunlight readability, while its open frame design offers convenient mounting flexibility. Both nROK and vROK systems have -30°C to +70°C (OT3) operating temperature ranges.

AI at the Railway Edge

The NEXCOM AI edge accelerator aROK range is specifically for rail artificial intelligence applications, employing artificial neural networks, machine vision, and machine learning. Delivering "Inference At The Edge" is NEXCOM's goal to help developers in dealing with mass computational-intensive processes efficiently and accurately, and avoiding the need to do it centrally in the cloud.
The 19" rack-mountable aROK 5510 supports 100 watts NVIDIA AI GPUs, coupled with Intel 9th generation and Xeon® CPUs; it can provide up to 128GB RAM. It also supports a high-speed NVMe drive plus six externally accessible drive bays, offering up to 24TB of on-train storage. Moreover, there are four optional PoE ports or dual 10GbE LAN along with multiple expansion ports connecting up to four LTE/5G modems and WLAN modems.

Although having the same CPU performance as aROK 5510, the aROK 8810 offers up to 450 watts of GPU power gaining the ability to support three PCIe x4 slots. Optional PCIe modules are available with two NVMe drive slots and four channel PoE ports, giving a total of 12 PoE ports.

With rich experience, wide options of reliable computing products, and recognised configuration/ customisation service, NEXCOM will always be the ideal partner for any on-train computing project. Delivering safety, convenience and efficient operational management will continue to be NEXCOM's top priority as it relentlessly strives to revolutionise the rail industry; reaching towards the promising future of AI.

Petrosoft.pl

RAILSoft – A Railway ERP Platform

RAILSoft is a railway ERP class platform having over 60 modules for comprehensive management of a railway enterprise (small, medium and large companies) available in various language versions. New software versions are delivered to the system (as part of the maintenance service), which introduce updates to changes in regulations and new functionalities in the field of purchased / subscribed software modules.

RAILSoft has been created by a team of Petrosoft.pl experts, ensuring work optimisation in the full range of railway processes. The system was built on the basis of over 22 years of experience and the expectations of our clients, and has been constantly developed for the last 14 years in the light of the latest requirements posed by the railway market. A team of several dozen analysts, architects and programmers are working to ensure that RAILSoft always offers the most up-to-date solutions in the field of planning, implementation, supervision and analysis of business processes: maintenance and operation of railway vehicles, maintenance

and operation of railway infrastructure, supervision of employees' competences, supervision of railway documentation, logistics and rail traffic. The system also supports reporting to railway offices and perfectly integrates with various ERP systems, GPS systems, DB Netz infrastructure, rolling stock auditor software and others. The combination of mobile technologies and IoT allows railway companies to supervise processes in the field in real time, both related to human work and the proper operation of machines, devices and vehicles.

The system collects real-time data from locomotives, wagons and railway infrastructure as well as from employees. Data collection is a very important element in the implementation of railway processes and is the basis for the optimal use of resources by a railway company. The implementation of the system eliminates the need to use additional IT tools, from Excel to other non-integrated programs. RAILSoft supports virtually all processes in a railway company: from enquiries, offers, contracts, orders, planning and dispatching, workshops, sidings, rental and leasing, settlement of costs and profitability, to issuing invoices.

The RAILSoft system has been implemented in 20 railway companies both in Poland and abroad and is aimed at:

- railway carriers
- entities in charge of maintenance
- rolling stock producers
- locomotive rental and leasing companies
- wagon rental companies
- siding managers and owners
- railway line construction and renovation companies
- infrastructure managers
- railway workshops

Petrosoft has implemented RAILSoft in over 20 different companies. One of the recent implementations was CTL Logistics.

Case Study: CTL Logistics

Comprehensive implementation of RAILSoft in CTL Logistics.
Implementation period: 2019–2020
Number of modules implemented: 57

CTL Logistics Group was established in 1992. It operates in the field of logistics services, transporting goods by rail and road, including across international borders. The company's activities include: forwarding, servicing railway sidings, maintaining rolling stock, construction and maintenance of railway infrastructure, reloading services, customs consultancy and the supply of raw materials. Geographically, CTL Logistics operates in Europe. Its main clients are coal and aggregate mining enterprises, fuel companies, chemical plants, household appliance producers, FMCG logistics, energy companies, container operators and many others. Over 25 years of presence on the market shows the company as a reliable business partner, which is one of the leading freight carriers in Poland.

Business Situation before Implementing the Solution

- realisation of the main business process, which is the planning and realisation of freight transport with the use of many tools and solutions (lack of coherent solution for the complete process)
- long delays in the data transfer from the field to the headquarters due to the manual flow of information
- generating risk of errors, poor efficiency and high cost of servicing main business processes due to inconsistent

RAILSoft
BUSINESS SOLUTIONS

and non-integrated IT solutions or the lack of them
- a huge variety of transport orders and a wide range of additional services and processes (fleet maintenance, workshops, etc.), which caused significant difficulties in optimising internal processes using the current fragmented and non-integrated IT solutions

Solution

The company Petrosoft.pl Technologie Informatyczne Sp. z o.o. completed the delivery and implementation of software for managing the railway company.

The work consisted of the analysis, production, delivery, configuration and training on the system operation, taking into account the dedicated, newly created functionalities of RAILSoft Business Solutions, which allowed for even more precise improvement and integration of processes carried out in the company's business environment with the newly implemented system.

The delivered system supports and improves processes related to logistics and rail traffic, such as:

- maintenance of rolling stock
- management of employees' competences
- customer relationship management (CRM)
- planning and implementation of transport
- mobile solutions for on-ground processes
- railway safety
- financial controlling
- operational controlling

All the most important resources of the company are defined inside the software, i.e. over 150 traction vehicles and several thousand carriages, constantly serviced by 176 office users and 249 mobile users (drivers and auditors) using the RAILSoft system. The system is constantly developed, improved and maintained in accordance with the requirements of the railway regulations of Polish law and the changing conditions of the constantly developing network and server environment and the individual business needs of CTL LOGISTICS Sp. z o.o. To meet these expectations with the highest standards, Petrosoft.pl remains fully operational by providing maintenance and service support services.

Benefits:

- Improvement of the transport process in each of its elements.
- Providing information on orders to clients.
- Real-time incoming transport data.
- Minimising the time needed for the flow of information between organisational units in the company through a uniform and coherent system.
- Improving the ergonomics of work of individual organisational units of the company.
- Transparency of information on the state of implementation of individual transport services.
- Streamlining and simplifying the reporting process through the built-in reporting module and the ability to analyse data directly in the system.

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Technologie Informatyczne

3Squared

Technology as a Transforming Force for Freight

James Fox, Commercial Director and Co-Founder, 3Squared

The pandemic has radically changed the way we live and as we near the two-year anniversary of the first UK lockdown, it is a natural time to take stock and reflect on how life has changed, and the role that the rail industry will play now and in the future.

In no greater way can these significant changes be seen than in the way we currently use the UK rail network in 2022. With more of us working remotely or using a hybrid working model, the network is adapting to changes in the way that we live, work and travel on a near daily basis.

So where does that leave the role of the UK network? With a reduction in passenger numbers, how can operators seize the opportunities presented by the pandemic and adapt to the way we live, work and travel today?

A Future Fit for Freight

The need for fast-moving consumer goods (FMCG) to be delivered efficiently and quickly has never been more essential elsewhere across the country to achieve a better work-life balance. However, when countered with the need for greener, sustainable means of receiving our goods, there can only be one answer – freight.

Freight transport is undoubtedly the greenest and most environmentally friendly means of transporting goods across the country. According to the Rail Delivery Group's **"Levelling Up Britain"** report, each tonne of freight transported by rail produces over three quarters (76%) less carbon emissions compared to road, and rail freight cuts Britain's carbon footprint by preventing 7 million HGV journeys per year. It is a rapidly evolving market, with the value of a rail freight path now estimated to cost £1.5 million each year.

Creating New Technologies to Support the Growth of Freight

Whilst it is positive to see the increased opportunities for the freight market, there are complexities around how paths can be opened to accommodate this growth and how to effectively balance the needs of both freight and passenger operators.

Here at 3Squared, we passionately believe that technology has the power to solve the key

challenges and complex issues that the industry faces. With that in mind and to prepare for the future growth of freight, we have developed **PathPlanner**, a tool which aims to resolve these problems and more.

PathPlanner aims to assist freight and passenger train operators to better manage their very short-term planning (VSTP). As it stands, VSTP currently operates under control conditions – i.e., additional trains that are needed are entered manually into operational systems by control staff.

PathPlanner has been designed with freight operators in mind, as it finds grey space in the timetable to add previously validated schedules at short notice, therefore maximising freight movement, productivity, and asset optimisation, whilst improving fuel efficiencies and reducing idling. From a passenger operations point of view, the system can help manage VSTP during periods of disruption, cancelling and adding schedules seamlessly, in turn increasing productivity and asset optimisation.

One key benefit of the PathPlanner tool is that it evolves alongside the needs of its users. To achieve this, we are focused on a series of several enhancements to the system this year, including:

- searching and merging paths
- eliminating manual requests and path creation
- timings and schedules passed to control for stock and crew allocation, and integration with allocation systems
- passing the path into TRUST
- automatically generating conflict-free paths, which are validated at junctions and platforms
- creation of contingency plans
- machine learning for path optimisation

Embracing New Opportunities

Freight will no doubt continue to play a significant role in the UK transportation industry, reinforced by its green credentials and the increasing need to get goods off the road and transported across the UK in a more sustainable way. The opportunities for freight operators are endless; however, to navigate the challenges that may emerge, adopting technologies and solutions that support these opportunities will be critical. We look forward to supporting the industry to deliver a future railway that supports the way in which we live today.

About 3Squared

3Squared is an award-winning Sheffield-based rail technology and software development consultancy, founded in 2002. Specialising in the development of mobile and web apps for major clients across the construction, rail and manufacturing sectors, 3Squared operates both in the UK and on an international level, delivering innovative and ground-breaking technological solutions that aim to propel the rail industry forward.

James Fox, Commercial Director and Co-Founder, 3Squared

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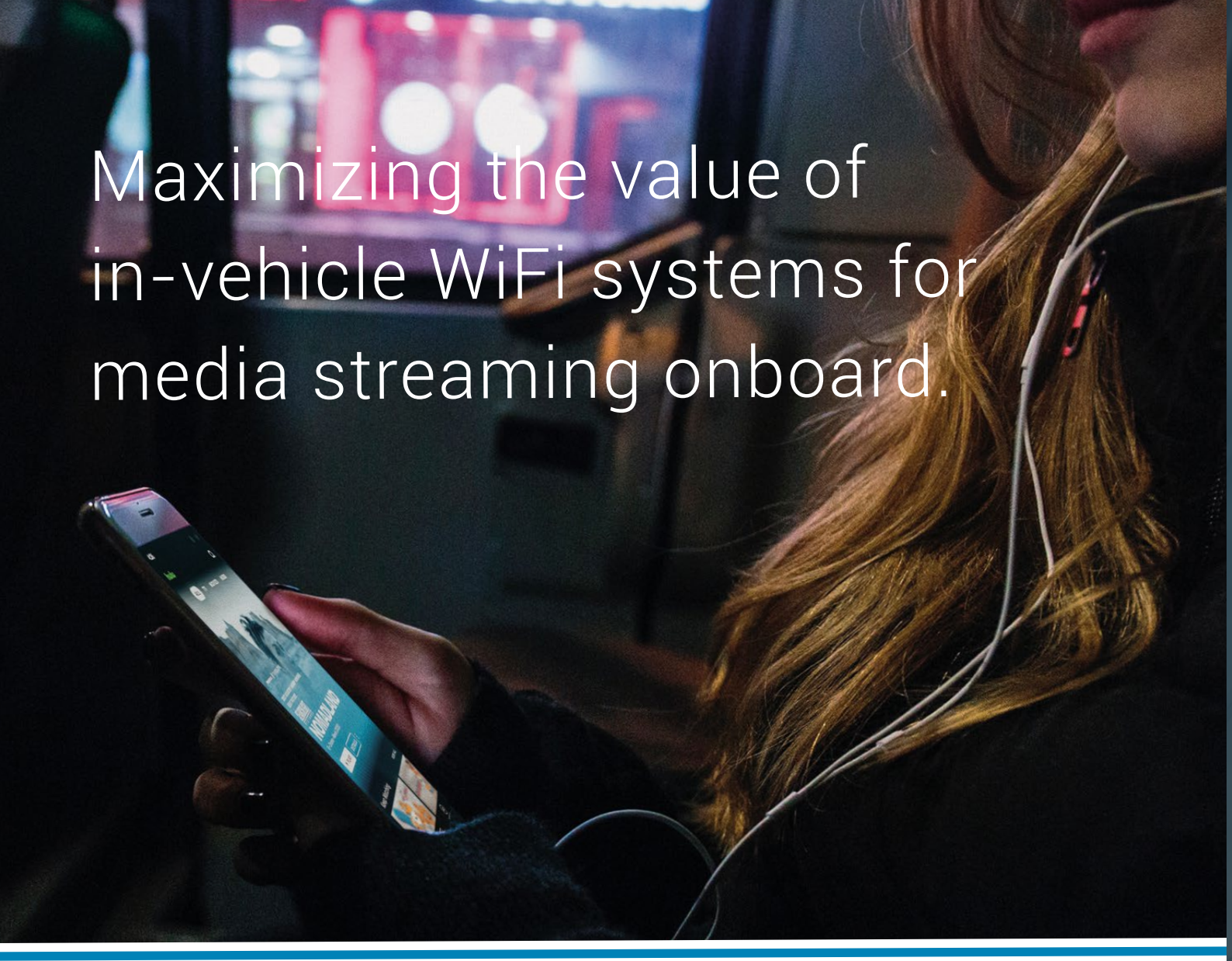

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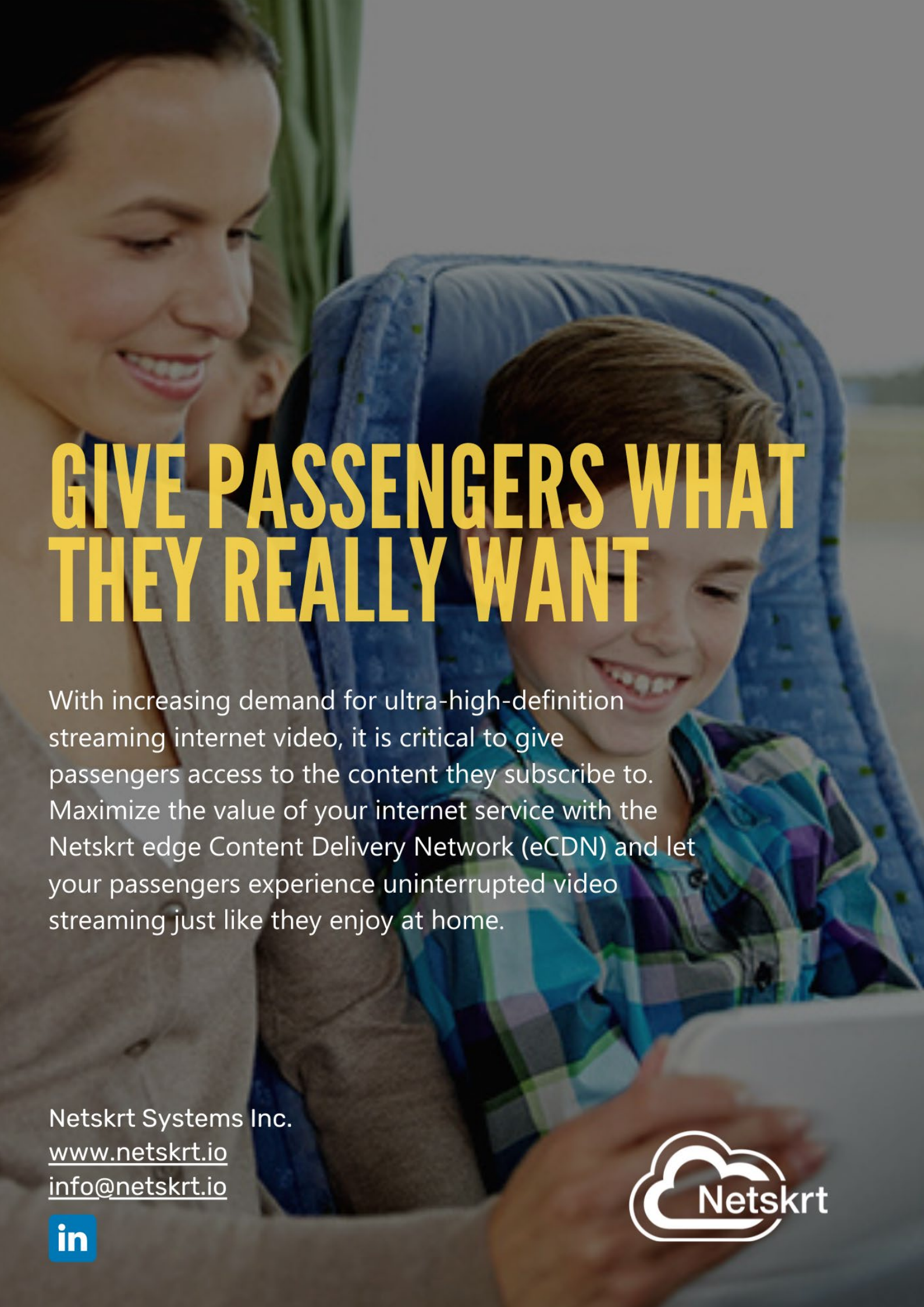

GIVE PASSENGERS WHAT THEY REALLY WANT

With increasing demand for ultra-high-definition streaming internet video, it is critical to give passengers access to the content they subscribe to. Maximize the value of your internet service with the Netskrt edge Content Delivery Network (eCDN) and let your passengers experience uninterrupted video streaming just like they enjoy at home.

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It is not news that customer experience plays a dominant role across industries and can be an important determiner of the success or failure of products or services.

In the highly competitive and technologically driven world, many industries are experimenting with multiple platforms with an ambition to offer exceptional services to their customers.

A similar trend can be witnessed in the railway industry which is expanding its service offerings to meet the emerging demands of its customers and deliver a memorable passenger travel experience. The players operating in the space are required to adopt a passenger-first approach, in order to emerge successfully during these challenging times.

Unveiling the New Aspect of 'Customer Experience'

The Covid-19 pandemic has impacted us all in one way or another. With people restricted to their homes during the lockdown, we have adopted several habits that are here to stay for the long term. The successful implementation of work-from-home culture has allowed people to reduce their commute time and use it to indulge in their favourite pastimes like outdoor activities, fitness, individual hobbies and so on.

Besides, owing to recent lockdowns, there has been a tremendous surge in video streaming/viewing. Recent research revealed that among all over-the-top (OTT) capable homes, streaming video accounted for **25%** of the total television viewing minutes in 2020, up from 19% in the fourth quarter of 2019. The cumulative weekly time spent on streaming video in the second quarter was 142.5 billion minutes, an increase of a whopping 75% from the 81.7 billion minutes recorded during the second quarter in 2019. The stats hold a validation to what defines the emerging needs of the consumers today.

Even though people indulge in various activities while being online, video streaming occupies a major chunk of that time. Due to the soaring demand in video consumption expecting a steady internet connection on the go for uninterrupted video viewing is not too much to ask for. Therefore, for railway companies/operators, the need to improve their existing infrastructure to provide better internet connectivity and enhance the overall customer experience has become even more critical.

Netskrt eCDN: Giving Passengers What They Really Want

Though most of us enjoy seamless high-quality internet connectivity at our homes and offices, it becomes difficult to have a comparable experience while travelling. Even the latest 5G technology is not able to meet the soaring demand for video

streaming, particularly in mobile environments. To meet this requirement and passenger preference, railway operators are compelled to rethink their existing offerings and provide stable internet infrastructure to the passengers onboard.

Though most railway operators already offer internet connectivity to their passengers, the internet capacity on trains or in mobile environments is restricted and not up to the mark. Consequently, railway operators are forced to block streaming video sessions. As an alternative, the passengers are offered walled-garden video-on-demand (VOD) systems. However, since these are obsolete and compare poorly with the plethora of video content available online, they fail to satisfy the growing video appetite of the passengers. To address this, Netskrt Systems has developed the eCDN (edge content delivery network) with a promise of enabling streaming video, everywhere. The advanced technology augments existing CDNs, enabling them to reach unserved or poorly served locations. It combines edge caching with cloud-based analytics and dynamic network adaptation. The cloud analytics and edge software are positioned at the “absolute” edge, to allow users to leverage their existing internet video subscriptions at speeds faster than they get at home. Furthermore, the Netskrt eCDN cloud is capable of learning consumer preferences over an extended footprint, allowing it to efficiently ingest, transform, and prioritise content for distribution.

Today, as the needs of the passengers have evolved, smooth and flawless internet connectivity has become an indispensable part of the rail travel experience. Netskrt eCDN has been developed with a vision to offer the best content delivery network to the passenger onboard. With a commitment to provide a connected future to passengers, this incredible technology decreases congestion on 5G rollouts and offers unlimited entertainment choices to passengers, thereby delivering on the promise of internet video streaming, EVERYWHERE!

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Comtest Wireless

The Importance of Drive Tests

Drive tests are an important part of ongoing rail telecoms and signalling service assurance as well as of rail telecoms network acceptance. Comtest Wireless explains why.

What Are Drive Tests?

In summary, drive tests are an essential element in measuring and assessing mobile radio network coverage, capacity and quality of service (QoS), using specialist electronic equipment that measures mobile network air interface.

Drive test systems can therefore, collect and record information relating to a telecom network's service within the test geographical area. The results can be used to measure the QoS against pre-determined KPIs, as well as for diagnostics and troubleshooting.

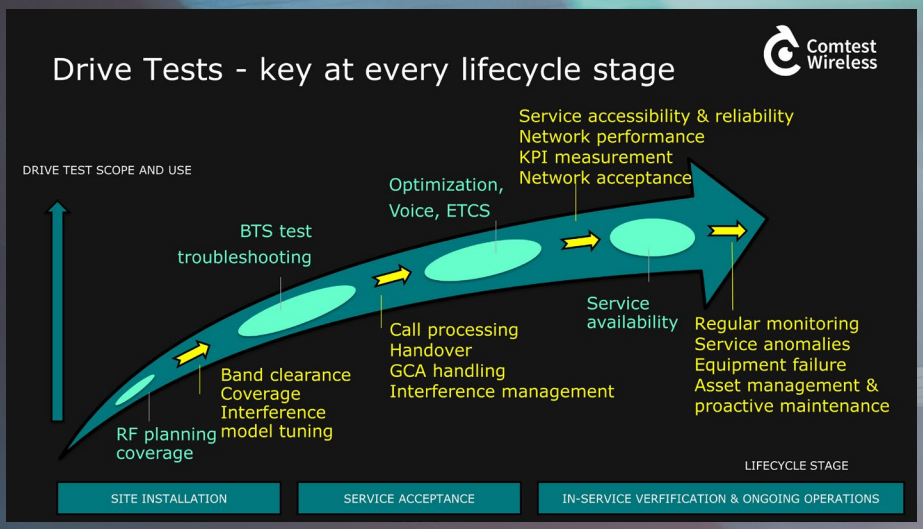
Drive Tests for Rail Telecoms Network Acceptance

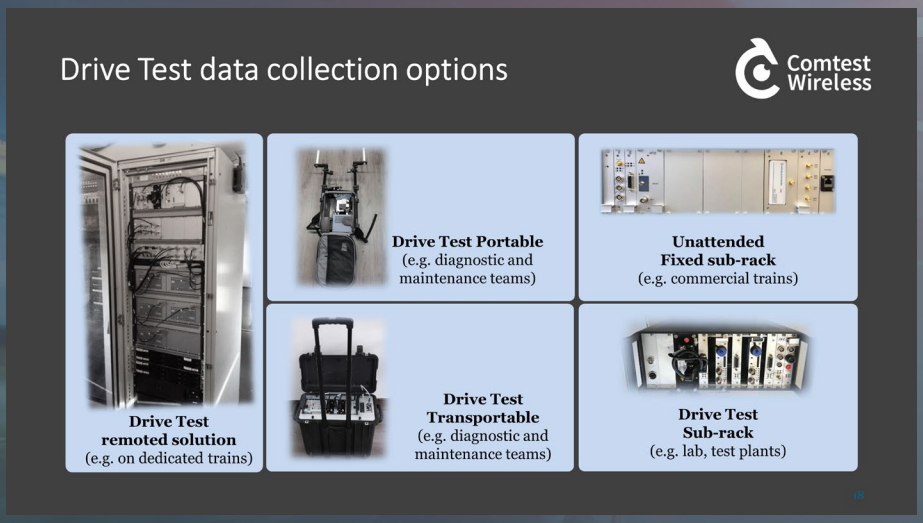
The initial test & measurement of a rail telecoms network normally takes place at the installation and acceptance stages, using a drive test system. Even before installing the network, drive tests are used to check if the frequencies to be used are affected by interference from third parties (known as band clearance).

During the installation phase, first coverage and network accessibility tests are performed, which are followed by reliability testing, travelling across the network.

The key rail test specifications (Eirene SRS and FRS together with O-2875 and Morane) are normally carried out by telecom vendors but it is also key for railway operators to know exactly which specification/ standard and service levels the network is compliant to as KPIs for voice may differ from data.

As drive tests are the most common way to gain network acceptance, it is easy to pigeonhole





their use. However, many leading rail operators around the world regularly use drive tests for the whole of the railway operations lifecycle.

Ongoing Drive Tests for Operational Lines

After a network has been fully accepted, an ongoing network monitoring & troubleshooting routine should be established as an integral part of daily operations and maintenance. Critical situations can occur if there are issues with interference or equipment failure on operational railway lines. Based on operational experiences, an ongoing proactive maintenance or service assurance campaign is highly recommended to ensure critical levels of quality and service are maintained, especially for rail networks operating ETCS level 2 signalling and above.

When systems fail, the ground-train communication can potentially cause train stoppage and delays. This can be critical when operating at high utilisation levels with many trains running every hour. The ability to source and pinpoint issues quickly, efficiently and effectively can be vital for maintaining continued train operations.

This ensures QoS standards and operational KPIs are met; not only giving service assurance but also making it easier to identify trends and areas of service degradation caused by interference, for example.

One Size Drive Test Does Not Fit All

Rarely is there one perfect solution for all circumstances and the same applies to drive test systems. Comtest Wireless provides several options to suit, depending on the budget and drive test requirements.

Dedicated test trains or test wagons can provide the facility to permanently install drive test equipment, often as racks including options for unattended and remote management.

Alternatively, transportable solutions such as customised on-board units, equipment housed in a trolley or backpacks can often be more suitable.

For example:

- if tests need to be carried out less frequently (making a permanent installation not cost-effective)
- when using commercial trains (so equipment cannot be permanently installed)
- when tests must be conducted in multiple locations within a short space of time (so a test train is less practical)

In each case, it is important that the drive test system is designed to match the correct type of radio, scanner, power source, antenna connections, physical and other system requirements necessary to meet the specific type of test(s) required.

What Next?

If you have found this article useful, please contact **Shelley Robertson**.

Testing & Monitoring ETCS Level 2 Operations with Comtest Wireless

How to save time and money with Comtest Wireless NetProbe Combined rail telecoms and signalling network performance monitoring.

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Zonegreen

SPAD Risk in Maintenance Depots

Signals passed at danger (SPAD) have long been a serious concern for the rail industry and have resulted in several high-profile accidents.

When two passenger trains collided in Salisbury in October last year, a major incident was declared by the emergency services and 15 people, including one of the drivers, were taken to hospital.

Preliminary findings by the Rail Accident Investigation Branch (RAIB) attributed the incident to the South Western Railway train involved in the crash passing through a stop signal, which occurred as a result of low adhesion between the wheels and the track.

In its 2019/20 report, the Rail Safety and Standards Board (RSSB) noted SPAD levels were at their highest since 2008. Perhaps surprisingly, empty coaching stock (ECS) make up almost 20% of SPADs nationally, despite accounting for just 4% of train services, and in period ten of 2020, there was a spike, predominantly made up of ESC-related SPADs.

Reasons for ESC SPADs

Why do so many empty trains pass signals at danger? The RSSB Mitigating Against Empty Coaching Stock SPADs report 2021 found that 52% of all incidents were due to the driver failing to check the signal aspect. This was twice that of the next-biggest reason for ECS SPADs – a misread signal.

The explanations as to why drivers fail to check the signal aspect when operating ECS services are many and varied, but often they are the result of inattention, distraction or loss of concentration.

Further considerations highlighted by the RSSB report included the limited protection afforded to ECS movements by train protection warning systems at the signal.

Most ECS SPADs seem to happen during busy times for train movements in and out of depots, yards and sidings – before and after the morning peak and again after the evening commute is over, when most passenger services stop and rolling stock returns to stabling.

Given that depots are less likely to have automated train protection systems, their infrastructure and the people who work within them are at significantly increased risk of harm from SPADs.

Protection and Prevention

There is no question that SPADs in rail depots can be catastrophic. A vehicle that fails to stop where it is intended could crash into the maintenance shed and plough into the path of unsuspecting staff.

Sheffield-based rail safety specialist, Zonegreen, is working with depot operators to limit the risk of SPADs through the implementation of its renowned Depot Personnel Protection System (DPPS).

The innovative technology manages the safe and effective movement of rail vehicles in and around depots. Network Rail-approved derailers are used to protect staff working inside maintenance depots, physically eliminating the risk posed by SPADs.

Zonegreen's derailers are controlled by intuitive Road End Panels situated adjacent to the depot doors with direct line of sight of the physical protection. Staff access the system using RFID tags which are programmed with various levels of authorisation. When someone has logged on to begin working on a road, the derailer is prevented from being lowered, physically protecting the road that is in use from train movements, even if a signal is passed at danger.

Christian Fletcher, Zonegreen's Technical Director, said: *"A lot of consideration has gone into the human factors involved in depot protection and this has enabled us to find ways to make DPPS easier to operate, actively avoiding error and leading to large productivity gains for our customers. Whilst DPPS cannot prevent SPADs from occurring, workers can carry out their duties confident that every possible step is being taken to protect them from serious harm.*

"Our research shows SPADs are a serious concern for depot operators, but we believe our technology has the potential to reduce the number of incidents occurring annually, particularly among ECS services."

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

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The Smart DPPS™:

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It is:

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Pfaff Verkehrstechnik

Pfaff Verkehrstechnik Supplies Lifting Equipment for New Intercity Fleet

The Mariyung Maintenance Facility in Kangy Angy

The New South Wales (NSW) government is delivering a new intercity fleet – the Mariyung fleet – to replace the trains carrying customers from Sydney to the Central Coast, Newcastle, the Blue Mountains and the South Coast.

To service and maintain the new fleet, a purpose-built train maintenance facility has been set up at Kangy Angy on the NSW Central Coast.

At this facility a hybrid lifting system by Pfaff Verkehrstechnik was supplied which will be used for performing maintenance works on the six-car vehicles in the new intercity fleet in New South Wales. In total, Transport for NSW has procured 610 cars.

The hybrid lifting system has a load capacity of 336 tons (56 tons per car) and is installed in 500mm deep foundation pits.

In terms of functionality, the system corresponds to an underfloor lifting system, meaning that individual bogies can be

pushed and removed under the lifted vehicle.

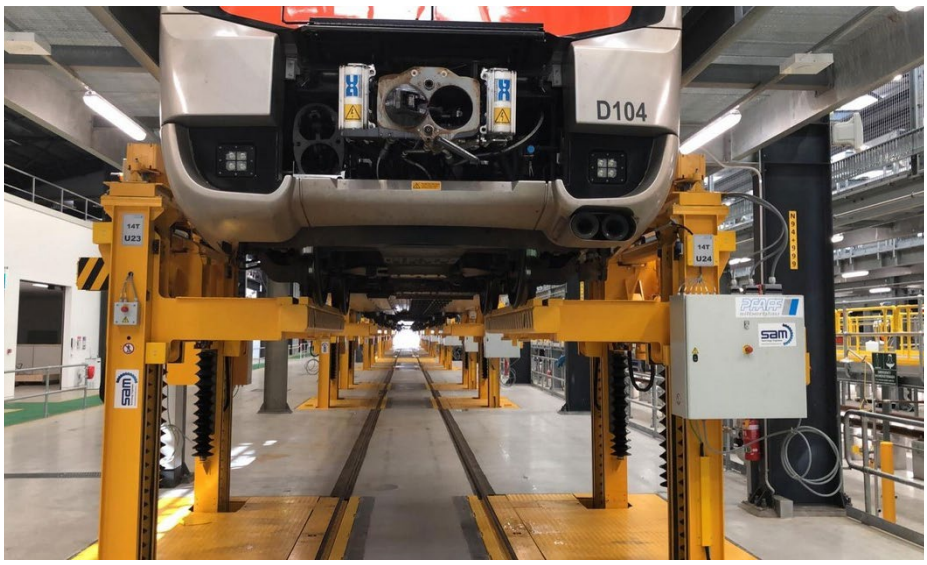
A special feature is the all-round adjustable body support elements which can be adjusted electrically in all directions (up/down, left/right, forwards/backwards).

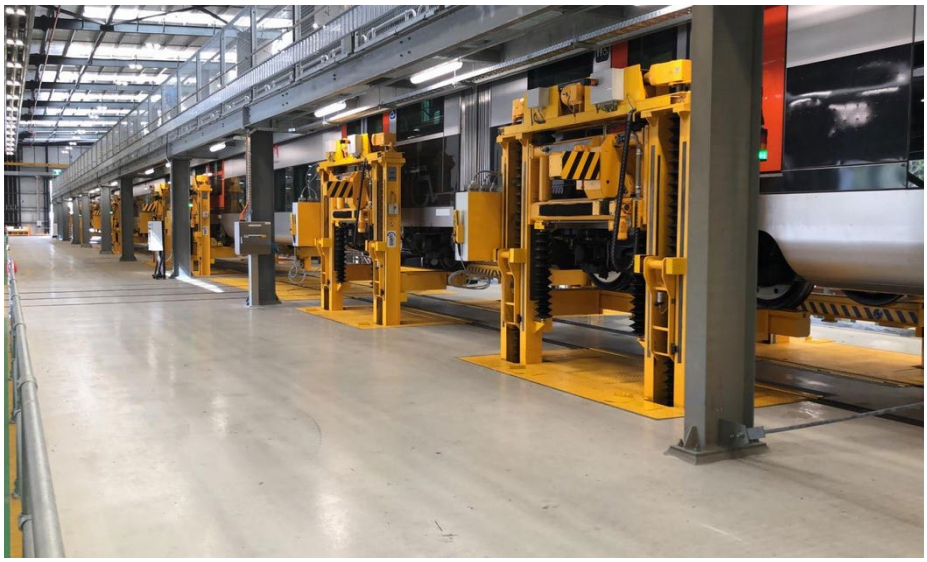
Pfaff Verkehrstechnik delivered the complete system to Australia in a total of 13 40ft containers. Our local partner, SAM Technology, carried out the installation.

Commissioning, which had to be carried out remotely due to the local Covid-19 regulations, was a very big challenge due to the complexity of the system and the time difference between Australia and Europe.

The process was ultimately completed successfully in April 2021.

The end-customer in Australia is very satisfied with the delivered product.





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Assenta Rail

Railway Maintenance Company Assenta Rail Is on a Growth Trajectory

Edinburgh-based railway engineering company, Assenta Rail, continues to go from strength to strength following the opening of its Hamilton rail maintenance depot in late 2019.

Since opening its rail depot in 2019, the company has invested significantly in upgrades to the infrastructure and increasing both the capacity within the depot as well as the range of facilities on offer.

Assenta Rail has been in business since 2001 and during this time the business has grown organically, focusing on a key group of core clients and priding itself on offering tailored engineering solutions to its book of clients. Having firmly established itself as a consultancy with significant expertise at solving challenging engineering problems, the progression to operating its own maintenance facility was a natural development. Establishing Hamilton LMD as a base for its operations allowed the firm to bring its engineering offerings "in-house" and to be able to offer a full turnkey service to clients.

In the two years since opening the depot, the firm has installed a paintshop; purchased two sets of 15t jacks to facilitate works over its pitted roads; and carried out extensive upgrade works to tracks and sidings within the depot. With the increasing development within the depot, the firm has also become an important employer within the local area and now provides employment for more than 20 local engineers, technicians and artisans based out of its Hamilton rail depot. The firm takes pride in its ability to continue the tradition of highly skilled railway engineering in the Lanarkshire area and actively employs locals with extensive experience to bolster its base of knowledge within the company. As a forward-looking business, Assenta Rail currently also employs apprentices and trainees who are learning their trades from more experienced personnel. As the company continues to develop over the coming years, these talented young people will become key members of our committed and supportive workforce. The ongoing development of our team is the key driver of our future success.

Starting from a strong position with a core base of key clients, by establishing the Hamilton maintenance facility, Assenta Rail has been able to significantly expand its services to both existing and prospective clients. For established clients, the depot has delivered a convenient location for maintenance of existing vehicles as well as a base for exciting new projects. These include substantial vehicle overhauls and full refurbishments of vehicles. With this expansion of both capacity and facilities, Assenta Rail has also been able to develop its client base. One of the key clients to select Assenta Rail to carry out a range of works on its behalf has been Abellio ScotRail. As the national operator within Scotland, Assenta Rail is proud to have worked with and delivered on a number of projects for them over the past 12 months.

This work has included repairs to various fleets of vehicles, paint upgrades and repairs following the derailment of a Class 43 and Mark 3 vehicle at Dalwhinnie. The Class 43 repair was particularly interesting as bespoke repair solutions were required. This project required the full suite of engineering services Assenta Rail provides. The challenges of this project brought all the disciplines together to work in synergy, from technical design, specialist welding, painting and livery.

As the company continues to develop, the services offered are underpinned by Assenta Rail's ongoing certification as an Entity in Charge of Maintenance. As the only certified ECM in Scotland, Assenta Rail employs robust processes to ensure that control of maintenance has the absolute focus on safety, quality and efficiency. Operating out of Assenta Rail's Edinburgh-based headquarters, the consultancy side of the business continues to provide oversight of the company's maintenance facility to ensure strict adherence to standards and regulations. Assenta Rail's consultancy work is also developing as the maintenance delivery function continues to do so. Having significant experience in project management, engineering design and developing engineering solutions, the company is currently involved in a number of complex consultancy projects including bespoke design of HVAC systems for European rail vehicles, development of central door locking systems, installation of controlled emission toilets (CET), engineering change on a vehicle conversion project and an approvals project to secure authorisation to operate a new fleet of vehicles in GB.

The past two years have seen significant growth for Assenta Rail on a number of fronts: personnel, facilities, clients and services. However, the firm is not finished growing yet. As an independent railway maintenance company based in Scotland, Assenta Rail is planning and developing for the future. With a narrow choice for innovative railway engineering solutions in Scotland, Assenta Rail aims to change this and rejuvenate the sector by offering comprehensive and competitive services. As part of this development, upcoming improvements include the construction of a new maintenance shed to further increase workshop capacity;

upgrades to existing sidings to provide further stabling capacity; and continued investment in plant to increase both the type of services Assenta Rail is able to offer and the capacity of the number of vehicles that can be simultaneously worked on. Maintaining a competitive, gold standard service is a key to the company's growth strategy. Over the coming years Assenta Rail aims to continue bringing new life to the industry in Scotland and to welcome clients both existing and new to our facilities as development continues.

Find out more at
assentarail.co.uk

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Our expertise covers a wide variety of vehicle types including passenger stock and freight wagons. With projects ranging from small modifications on individual vehicles to large fleet refurbishment and replacement.

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Assenta Rail has an expansive range of depot facilities inlcuding: Paint Shop, Bogie Press, Vehicle Lifting Jacks, Overhead Crane and Workshop with Pits.

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Totalkare

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Totalkare has been supplying workshop equipment in the UK for more than 40 years, with a proven track record for product quality and after sales support.

Leveraging its position as the UK market leader for the supply of mobile column lifts for heavy duty commercial vehicles, Totalkare entered the UK rail market at the start of 2019 after partnering with experienced Italian manufacturer Emanuel, themselves boasting more than 100 years in the industry.

Railway Lifting Jacks

Initially offering railway lifting jacks, Totalkare's mechanical knowledge and established UK-wide field service coverage, combined with Emanuel's longstanding reputation for build quality, represented an impressive proposition for rail manufacturers and the UK supply chain alike.

Orders followed from the likes of Hitachi Rail and Mirage as awareness of Totalkare's entry into the market grew.

Available in a range of lifting capacities from 5,500–50,000kg per jack, Totalkare's railway lifting jacks can be configured in sets of four to 128 (facilitating the lifting of a single carriage or an entire train) and are designed to meet Machine Directive 2006/42/CE and approved to European standard EN1493.

Available with fixed or movable anvil, the electromechanical lifting jacks are supplied with a computerised control unit with event storing and recording that can be upgraded with self-programmed maintenance.

Rail Inspection Pits

In 2021, Totalkare extended its product offering in the rail market to include pre-fabricated steel inspection pits for rail depots. A bespoke offering manufactured to customer requirements, Totalkare's rail inspection pits make access to the underside of a railed vehicle easy, allowing engineers to work in a safe, well-lit environment.

Fully welded construction prevents water ingress. The pits are installed with a unique bond of steel to concrete for a long-lasting rolling stock maintenance solution that offers a more permanent alternative to railway lifting jacks.

Do you require support with your rolling stock maintenance?

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GEOWEB® Geocell Reinforcement Improves Structural Performance of Railway Track Beds

Every year, railroads dedicate a great deal of capital and resources towards creating and maintaining high-quality track profiles. Providing a well-designed track profile is the foundation on which a successful rail line operates.

With ballooning rail traffic carrying heavier loads than ever and increased occurrence of extreme weather events, a stable track profile is essential for successful operation.

GEOWEB® geocells have been used in the track bed for rail applications worldwide for more than 40 years. Through an interconnected honeycomb-like network, the HDPE-based GEOWEB® Soil Stabilisation System provides apparent cohesion and strength to materials that would otherwise be unstable over soft subgrades. Geocells stabilise the ballast, reduce vertical and lateral stresses and limit ballast movement. Stabilisation within the geocell system provides a longer lasting track profile that extends rail service life, while also reducing maintenance cycles and recurring maintenance costs. Research has shown that geocells reduce settlement of the ballast foundation and can reduce required cross-section thicknesses by up to 50%. This is particularly advantageous where track beds must be constructed over soft soils. The reduction in thickness leads to cost savings, along with an accompanying reduction in carbon emissions due to decreases in aggregate processing, transportation, handling and installation. In general, geosynthetics offer tremendous potential in reducing carbon emissions from civil construction projects, in many cases by 50% or more.

North West Electrification Programme Case Study

In the United Kingdom, Network Rail encountered extremely soft soils with low shear strengths during track modifications to the North West Electrification Programme. Due to soft subgrade conditions, conventional track design methods resulted in cross-sections as thick as 1 metre. Poor soil conditions along the track route required a soil stabilisation solution to improve undertrack stiffness and provide a more cost-effective solution. The Network Rail Track Bed Investigation (TBI) team elected to evaluate an alternative solution using

geocells to reduce the required cross-section thicknesses. The GEOWEB® Soil Stabilisation System has been used under track in the United Kingdom since the 1980s; however, very limited information was collected at that time to document the resulting improvement in performance. Therefore, the TBI team used in-house numerical modelling to validate the design approach, and results indicated that a geocell-stabilised track performed as well as the conventional full-thickness cross-section. Based on this information, combined with the demonstrated long-term stabilisation of the above-referenced early installations, the TBI team elected to use the alternate track bed design incorporating GEOWEB® geocells. The North West Electrification Programme subsequently approved the use of geocells on a number of sections with the goal of reducing construction depth, and in turn reducing costs associated with track enhancement and long-term maintenance.

After installing the GEOWEB® Soil Stabilisation System on the North West Electrification Programme in 2017, track quality improved significantly. The reduction in the required track bed construction materials (40% reduction in granular fill material), reduced the cost of track enhancement by approximately 22% (Wehbi, et al., 2018). Network Rail also realised the benefit in the ability to use granular fill and coarse sand as ideal infill materials. Network Rail's experience using geocells has shown substantial construction cost savings and benefits to the structural integrity of the track bed (Wehbi, et al., 2018). Network Rail has also monitored Willesden North

Installation: expanded GEOWEB® geocells

Network Rail has approved the GEOWEB® Soil Stabilisation System as the solution in areas with soft soils to improve and regulate track bed stiffness, while reducing maintenance, installation time and cost.

GEOWEB® geocells achieve all requirements of the Network Rail Track Bed Standard NR/L2/TRK/4239, Issue 2 and accompanying guide "Use of Geocells" for below track installations.

on the London North East and Newham Bog on the London North West in addition to the Northern West Electrification Programme, which show similar results and benefits.

Based on their success using the GEOWEB® system in track bed applications, Network Rail developed a guide providing a summary of the benefits from research and testing, design recommendations, and best practices. In August 2020, Network Rail issued "The Use of Geocells in the UK Railway Track Bed, Technical Guide". The guide provides technical guidance based on extensive research conducted at the University of Kansas (UK) and Oregon State University (OSU), which includes existing geocell design methods, case studies from successful installations and industry-proven installation methods utilising specialised geocell ATRA® connection keys. The guide served as a reference for development of the Network Rail Track Bed Standard NR/L2/TRK/4239, Issue 2, issued in September 2020, which contains detailed design information and guidelines for using geocells in track bed applications.

Network Rail has approved the GEOWEB® Soil Stabilisation System as the solution in areas with soft soils to improve and regulate track bed stiffness, while reducing maintenance, installation time and cost. GEOWEB® geocells achieve all requirements of the Network Rail Track Bed Standard NR/L2/TRK/4239, Issue 2 and accompanying guide "Use of Geocells" for below track installations.

GEOWEB® Soil Stabilisation System provides apparent cohesion and strength to materials that would otherwise be unstable over soft subgrades.

Installations: infilling GEOWEB® geocells

COMBAT RAILWAY BALLAST STABILISATION PROBLEMS

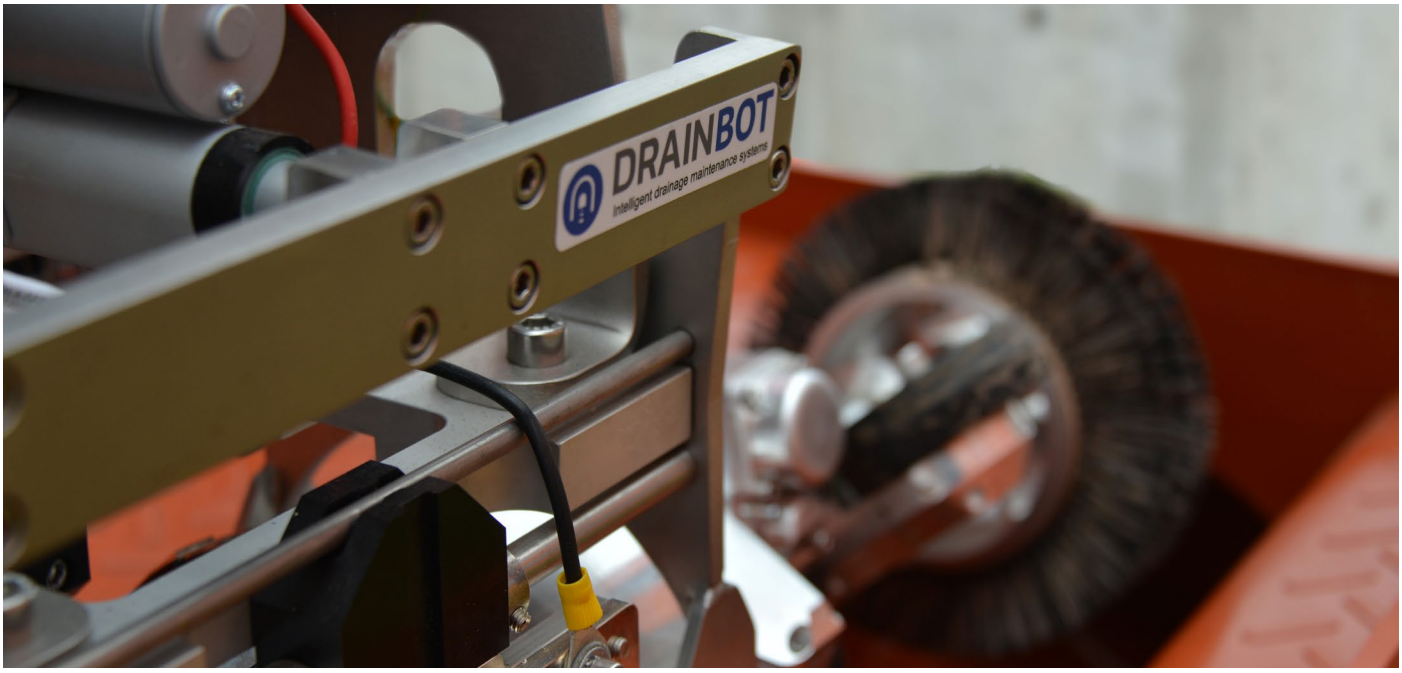
PRESTO GEOSYSTEMS®
STRENGTH. FROM THE GROUND UP.
Since 1979

GEOWEB® Geocells

Advanced Geosynthetics Technology

DrainBot

The First Autonomous System for Road and Railway Tunnel Drainage Maintenance



DrainBot is the first autonomous system developed for the maintenance of tunnel drainage. Instead of the dominant water jetting technology, DrainBot applies intelligent robots to allow for removal and preventative maintenance of the drainage pipes.

This smart innovation completely removes the consumption of water from the process. Alsoinstead of using fossil fuels for operating the machinery, DrainBot relies on electricity sourced from a redundant battery system included in the body of the robot. By providing the operator with an autonomous charging system, DrainBot ensures almost permanent operation ultimately enabling preventative and predictive maintenance of the tunnel drainage. In addition, the robotic system collects various data through multiple installed sensors on the robotic body, for a better data analysis and interpretation which enables optimal personalised drainage maintenance.

Strong Foundations

DrainBot GmbH was established in Graz, Austria, in 2019. This is also where all products are developed and manufactured. With the advice and support from the best professionals with decades of experience in engineering, innovation and tunnel

maintenance, the young start-up delivers high-quality products and services for tunnel operators across geographies and sectors. Through partnerships and support of the leaders of innovation in Europe, DrainBot is continuously growing and working on delivering even more value to its existing and future customers.

The novel autonomous robotic system has been primarily created to be used in highway and railway tunnels. Nevertheless, the robotic system can be adapted easily and therefore be used in various other industries such as airports, underground, mining industries and many more.

"This system is the first significant leap in this sector in the last 25 years."
- Manager, Tunnel Operator in DACH

Tunnel Infrastructure – How It Works

Drainage systems in tunnels prevent the accumulation of water and subsequent damage to the structure. As organic and inorganic matter transported with the water builds sediment that reduces the tunnel diameter and efficiency, drainage systems in tunnels are maintained regularly.

DrainBot systems contain one or more robotic units that move through drainage pipes between multiple charging stations. While they move and collect various data, the perforated brush on the robotic unit cleans the walls of the drainage pipe, removing sediments in the flow direction ensuring longer lifetime of the drainage system without any interruptions of the traffic in the tunnel.

- Automated without a human operator
- Data-driven intelligent system
- Modularly extendable
- Unlimited cleaning run length

Unique Product

User Benefits

- <1.000 to/a CO2 emissions
- 0 l/min water consumption
- cost savings of up to 70%
- no locking times

DrainBot is an autonomous robotic system that reduces the cost and environmental impact of maintenance, while also reducing hazards for employees as their time spent in the tunnel is reduced to zero. It improves the profitability of tunnel operation through significant reduction in locking times, benefiting passengers, logistics companies and tunnel operators. Unlike water jetting solutions that use lots of water and heavy machinery, DrainBot uses only the resources in the drainage system.

Robust Hardware

DrainBot is an innovative system that uses an unconventional maintenance technique to improve the efficiency and sustainability of tunnels while reducing the costs and hazards related to drainage maintenance. The robotic unit is designed to withstand the harshest conditions in its operative environment. It is resistant to water, temperature changes, high mineral content, mechanical force and it can operate fully autonomously, making it adaptable for integration and operation.

2 months after water jetting

3 months after DrainBot installation

Value-Generating Data

DrainBot collects data about the status of the drainage in tunnels and uses this information to further optimise its efficiency.

"This way we can not only maintain the tunnel drainage, but also improve the insights we are gathering about its status and changes over time. In addition, collected data allows us to better

predict the maintenance intensity so the optimal status of the drainage can be kept at all times. This generates value not only to DrainBot, but also to our customers as they can always access the status of their tunnel drainage systems remotely, learn from it and optimise their operations based on the analysis we are offering," stated Philipp Lepold, one of the two founders and CEO of DrainBot.

Drainbot Tech for Green

Sustainable Technology

- Sustainable approach to water
- reducing carbon emissions
- increasing resilience of existing and new infrastructure
- responsible consumption and production

Investing in the Future We stand for:

Efficiency

Our fully automated robotic system is the most efficient and most suitable solution for drainage maintenance in tunnels used for both railway and road transportation.

Sustainability

DrainBot is the only technology on the market that uses only the resources within the drainage system, thereby reducing the environmental footprint of tunnels.

DrainBot robotic unit

Automation

The fully autonomous and robotic system uses a combination of several novel patented technologies and is able to communicate with us remotely at any time.

Innovation

Our innovative solution reduces the demand for resources and costs of drainage maintenance significantly making tunnels more efficient and sustainable.

Project: Zentrum am Berg

Unmatched Efficiency in Removing Sediment

In this project, supported by the European Commission Robotics for Infrastructure Maintenance and Automation programme, the DrainBot system showed unmatched efficiency in removing sediment and maintaining drainage pipe status. While the efficiency seems to vary with the type and the age of sediment and the frequency of maintenance of each single segment of the pipe, our technology offers a long-lasting solution for tunnel operators to reduce locking times while keeping their drainage systems operating at the optimum of their efficiency.

Perception

Our Vision Is Simple

"Our Vision is to enable more efficient, safer and more environment-friendly maintenance of tunnels through novel technologies. By focusing on the tremendous benefits for both the operators of infrastructure and their customers, we will continue to deliver innovative, technology-based, and sustainable solutions for tunnels.", Dr Slaven Stekovic, MBA, one of the two founders of DrainBot and COO/CFO.

Join us in improving the efficiency and safety of tunnels through intelligent, autonomous tunnel drainage maintenance systems for a better future.

www.drainbot.com

office@drainbot.com

DRAINBOT

Globe Scott Motors

Innovative Motor Solutions for the Rail Industry

With over 25 years' experience developing innovative motor solutions for the rail industry, Globe Scott Motors is renowned for its flexibility, quality and engineering expertise.

Globe Scott Motors is an internationally-renowned manufacturer of gear boxes and DC motors, and was the first to manufacture permanent magnet DC (PMDC) motors in India.

Created as an Indo-US joint venture in 1985, the company has gone from strength to strength, growing to become one of the most technically-advanced manufacturers in the sector.

Today the ISO 9001 2015 certified company has 120 staff – 25 of which are electrical, electronic and mechanical engineers focused on research and development (R&D), production and quality control.

To date this team has created over 5,000 different product designs for a wide variety of sectors from industry to transport. Not one to rest on its laurels, the company continues to innovate, with its team of expert engineers most recently developing **brushless DC (BLDC) motors**.

Motor Solutions for the Rail Sector

Well known for its **railway signalling solutions**, Globe Scott Motors offers a wide range of products for the rail industry including wound field motors, electric lifting barriers and electric point machines and even a BLDC motor for railway carriage fans.

Its motors feature rugged enclosures, high-energy magnets and precision gears and undergo rigorous testing procedures, and the company ensures that all products not only have a long life, but are also cost effective.
In its home country, Globe Scott Motors is Indian Railways' chosen provider of motors. It has been working with the rail operator for the last 20 years, and has supplied over 150,000 motors.

It's understandable then, that demand is also growing overseas, and today the company regularly exports its products to various sectors across Europe and Africa and it aims to include the rail industry in this list.

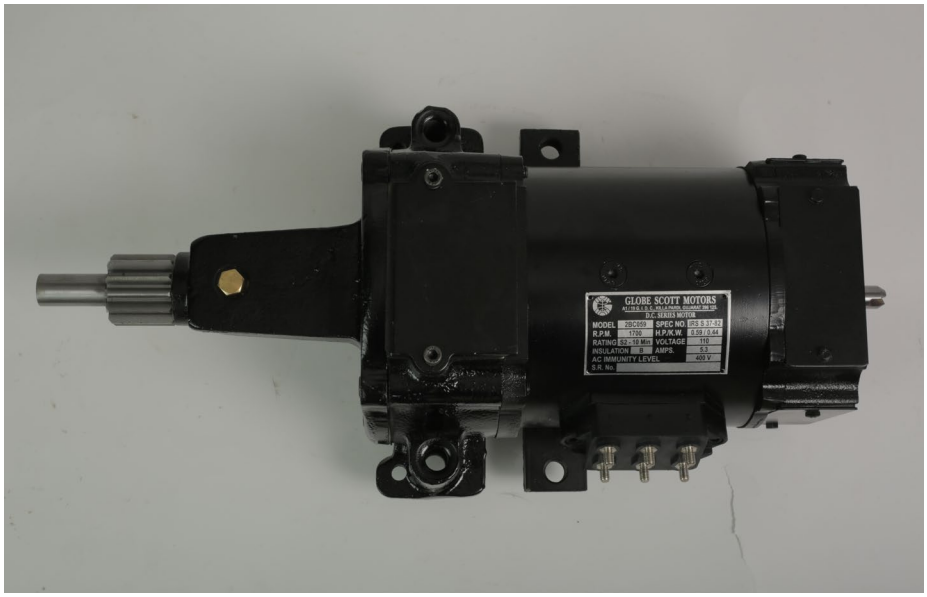
Watertight Motor Provides Solution for Heavy Rain

One of Globe Scott Motors's most innovative rail sector products is the watertight IP67 wound field motor. This was specifically developed in response to the challenges facing Indian Railways during the monsoon season, and is currently the only product of its kind.

"In India there is a heavy monsoon, especially in Mumbai, Delhi, parts of Chennai and Kerala. During this time many of the rail tracks become flooded and the point machines get filled with water, which can lead to motor failure," explains Cangi Calan, Managing Director at Globe Scott Motors.

"This problem costs the railway industry a lot of time, money and service delays and a lot of manpower is needed to fix or replace motors affected by the monsoon.

"In response to this issue, our experts developed a special waterproof motor, the IP67. So much time and money has been saved, and it's been great to hear from railway engineers telling us that they can now sleep properly during the rainy season and no longer dread receiving a call at two, three or four AM to rush out and replace a motor," he says.



Although developed with India in mind, this product will benefit rail operators around the world. Extreme weather is sadly becoming more common place – take the **disastrous flooding seen in Germany and Belgium** just last July – which shows the need for **railways to adapt in response to climate change**.

This is just one small solution that can help the sector fight back, and ensure rail continues to be a reliable, eco-friendly travel option now and in the future.

Why Choose Globe Scott Motors?

Known for its high-quality, cost-effective and innovative products, Globe Scott Motors is the perfect partner for rail operators.
Its in-house R&D team can develop flexible, one-of-a-kind solutions that meet a customer's bespoke needs, with engineers providing ongoing technical support as needed.

If you're interested in finding out how Globe Scott Motors can support you, why not get in touch with our Director, Niyatee Cangi, on

+91 7600516149 / +91 9825149510

export@globescott.net

GLOBE SCOTT MOTORS PVT LTD

Complete Composite Systems (CCS)

More rail construction projects are turning to the innovative, eco-friendly post mix TECHNO-CRETE® for their foundation material. Here's why...

TECHNO-CRETE® is a hydrophobic polyurethane foam foundation system. Made from a blend of reprocessed oil from the catering industry and sustainably grown rapeseed oil, it is rapidly becoming the prime post mix choice, offering a green and cost-effective alternative to concrete. Its ease of use and minimal bulk-dispensing qualities also ensure faster installation and reduce health and safety concerns.

How It Works

Available in two packs, part A of TECHNO-CRETE® consists of a blend of recycled organic mineral oils from the catering trade and rapeseed oil, while part B contains isocyanate.

When the two packs of liquid are mixed together and poured into the hole around the post, the liquid blend expands to 20 times its initial volume to create a lightweight, high-density foam. That foam mixture rises to fill the hole and encapsulates the post, becoming a solid mass able to hold the post within ten minutes. Curing time is 24 hours but the post is hard enough to fix to within one hour.

A huge advantage that TECHNO-CRETE® has over cement-based products is its ability to be used in inclement weather. If the ground or air temperature dips below 0 degrees centigrade, the water required to mix the concerete will freeze, whereas even if temperatures drop below zero, the exothermic reaction of TECHNO-CRETE® still takes place, resulting in no delays regardless of weather conditions.

Concrete Comparison

Concrete works by virtue of mass of material. In order to fill a typical 300mm diameter x 600mm deep fence post hole, 3 x 20kg bags of concrete post mix plus 20 litres of water would be required. TECHNO-CRETE®, however, uses skin friction

to its advantage and that same post would need just one 1.8kg bag of TECHNO-CRETE® — and no water — to support it.

Looking at the bigger picture, a major project involving 40km of fencing with posts at four-metre centres would require 10,000 holes. Filling those 10,000 holes would use 600,000kg of concrete post mix and some 200,000 litres of water. That's a total of 800 tonnes of material. At 18 tonnes of payload per truck, that's 45 truckloads of material.

But filling those same 10,000 holes over 40km the green way — using TECHNO-CRETE® — would only require 10,000 x 1.8kg bags of TECHNO-CRETE®. That's 18 tonnes of material, requiring just one truckload, resulting in a vast saving on transportation costs throughout the job.

Environmental Impact

Cement, which makes up approximately a quarter of concrete post mix, is the world's third-largest source of human-generated CO2 emissions. Cement is responsible for 8% of global CO2 emissions, and producing one tonne of cement generates an estimated 1.25 tonnes of CO2. So the 800 tonnes of concrete mix required for the 10,000 holes job referenced above would generate approximately 150 tonnes of CO2.

In contrast, the 18 tonnes of TECHNO-CRETE® required for the same 10,000 holes project would produce 18 tonnes of CO2. That's over 130 tonnes less CO2 emissions generated than when using concrete (equivalent to over 130 return flights from London to New York), not accounting for the additional CO2 emitted whilst transporting the materials to the site.

Operator Safety

With fewer tonnes of material to deal with on site, TECHNO-CRETE® reduces manual handling and results in fewer slips and trips, as well as less back damage and muscle fatigue amongst operatives. With fewer health and safety issues on site, injury claims are therefore decreased. In a recent COSHH assessment by a Tier 1 contractor run through market-leading risk management system Sypol, TECHNO-CRETE® was deemed to be harmless when used with standard PPE.

Another key advantage of using TECHNO-CRETE® is, if trackside access is poor, an operative can carry ten bags of TECHNO-CRETE® in a back-pack, effectively allowing them to serve ten posts on their own. Carrying 30 bags of concrete post mix and 200 litres of water would require more labour and increase non-productive costs, as well as heightening the chances of operatives suffering cement burns, one of the highest health and safety issues contractors have.

We are currently exploring the option for customers to have their required TECHNO-CRETE® supplied in bulk 200-litre drums or 1,000 IBCs (intermediate bulk containers). The mixing and dispensing would be undertaken by machine from a van or trailer.

Who's Using It?

More than 25 companies, including the likes of Network Rail and Siemens, have used TECHNO-CRETE® and are delighted with

the results and savings.

Following a successful trial, a deal has just been struck that will see TECHNO-CRETE® being used for the Transpennine Route Upgrade scheme, which is improving passenger connections between York and Manchester, via Leeds. The TECHNO-CRETE® foundation will support a GRP handrail system, ultimately involving thousands of bags of material.

TECHNO-CRETE® has also been chosen by rail construction and infrastructure experts Cleshar to be the foundation material to support the installation of a demarcation barrier on the Docklands Light Railway network. The sizeable job will result in a root-mounted, high-level barrier running from Shadwell to Bow Church and Limehouse to Tower Gateway, giving passengers a safe trackside evacuation route if they have to leave the train in the event of an emergency.

You can also read about how TECHNO-CRETE® was the ideal option during a recent challenging installation for Siemens on the Northern City Lines re-signalling project at Drayton Park in London **here**.

See TECHNO-CRETE® in Action

A demonstrative video of TECHNO-CRETE® being mixed and applied is available to **view here**.

For further information about the product, please visit the **dedicated TECHNO-CRETE® section on our website**.

In summary, TECHNO-CRETE® is a green alternative to traditional concrete post mix that:

- dramatically reduces the amount of CO2 emitted into the atmosphere compared to concrete
- saves on the cost of transportation and distances travelled compared to concrete
- reduces operator injuries and therefore injury claims, boosting health & safety records
- ensures faster installation times with less possession
- can be used in all weathers, unlike cement-based products that require water — which would freeze in low temperatures — for mixing

For enquiries about TECHNO-CRETE® and how it can be tailored for multiple applications across the railway industry, please contact the technical experts at CCS, the product's exclusive UK distributor:

complete composite systems

Complete Composite Systems Ltd

503 Broadway, Letchworth, Hertfordshire, SG6 3PT
Tel: +44 1462 659 876 or +44 7860 147863
Email: **info@completecomposites.co.uk**

The exclusive UK stockist of TECHNO-CRETE® is Scott Parnell:

Scott Parnell Ltd. RAIL DIVISION

Scott Parnell Rail Division

Asheton Farm Business Centre, Stapleford Abbotts, RM4 1JU
Tel: +44 208 8055797
Email: **rail@scottparnell.com**

TECHNO-CRETE® is developed by **Strucsol**

TECHNO-CRETE StrucSol Construction solutions

SOUNDIM

We block the noise, not your view.

No longer there is need to compromise the performance with the esthetics.

Eliminating noise at the source

Recyclable materials

Light weight and no need for special foundation

Easy and fast to install or to dismantle and reuse

Soundim noise barrier is a perfect solution for any rail project.

FOR MORE INFORMATION, PLEASE CONTACT

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Soundim

The Future of Railway Noise Reduction

Soundim offers rail companies a low-height barrier that reduces railway noise without restricting passenger views.

Soundim is a Finnish company that has developed an innovative noise barrier solution for the rail industry.

The idea for the solution first came from the Finnish Rail Administration (RHK) which, in 2009, published a report on the use of low-level barriers in combating rail noise. Soundim's founders took the findings of this report and began to design a solution that would meet the rail industry's unique requirements.

A Low-Height, Low-Cost, Noise Barrier for the Rail Industry

The company was officially established in 2012, the same year as its first test installation, when 60 metres of Soundim railway noise barriers were put into place near Helsinki.

Since then, the company has installed a further 2.2 kilometres along the Helsinki Circle Line in addition to multiple projects across Finland, including Tampere and Järvenpää.

It has also begun completing export orders – the first of which was for 600m of barriers near St Petersburg, Russia.

Blocking Noise at the Source

Most of the noise created by trains travelling at speeds of 200km/h or lower comes from the wheels and rails, which means sound barriers don't need to be high in order to lower noise pollution in the surrounding area.

Soundim's low-height noise barrier has been proven to reduce this noise by a minimum of 50% due to its excellent absorption (13 dBA / Class A4) and insulation (30dBA / Class B3), especially those high-frequency sounds which can be the most annoying.

Sustainability Credentials

Its unique sustainable design also means that production costs have been proven to be half those

of traditional sound barriers – a saving that's passed on to customers.

This is helped by the company's use of sustainable materials. For example, the absorption material inside the barrier is made from recycled plastic bottles.

"Sustainability is key to us, I like the fact that we use recycled materials wherever possible," says Tero Lepistö, Soundim's CEO.

Why Choose Soundim Noise Barriers?

Soundim's unique solution offers many benefits to rail operators. For example, the 2m and 4m lightweight elements can be installed directly to the track bed via fixing poles, without the need for landscaping or foundation work.

The lightweight barrier blocks – just as well suited to curves and structures like bridges as straight tracks – also enable fast and simple installation, minimising the time, costs and downtime rail operators face.

In addition, Soundim's solution includes a hinge mechanism that allows barriers to be individually lowered or even removed, also providing easy access to the barriers' integrated cable channels.

"This is one of our unique features," says Jukka Näräkkä, Head of Business Development at Soundim.

"Its flexibility means you can lower the barrier without having to dismantle it, which is very useful in case there's a need for maintenance work, or a large shipment travelling through."

A Flexible, Customisable Solution

Soundim's noise barriers offer a flexible, customisable solution that can be tailored to meet regional regulations and requirements.

"Our barriers are like Lego pieces you can put together in whatever form you'd like – they're modular so you can add them together to create a solution that suits you," says Lepistö.

The company is keen to hear from any rail operators interested in discussing how Soundim could create a bespoke rail noise barrier solution to fit their specific needs.

For more information on Soundim and its railway noise barriers, please visit **www.soundim.fi/.**

SOUNDIM

LiveEO GmbH

How Satellite Data Can Improve Railway Track Management Solutions

A revolution of sorts is taking place in Earth observation. The number of satellites in orbit is going to increase from about 8,000 to 57,000 by 2029.

This will result in a massive increase in higher-quality data, leading to new use cases for satellite imagery analysis. One of those use cases is identifying threats to linear infrastructure, including vegetation encroachment and ground deformation.

Vegetation around infrastructure networks, such as railway tracks, can cause severe problems for operations. Equally concerning are ground movements, with landslides or even derailments the result. Traditionally, these risks were managed by manual track inspections, which is expensive. Satellite-based monitoring provides highfrequency overviews of the entire network along with actionable insights for segments that demand immediate attention.

Satellite Data & AI-Powered Vegetation Management

LiveEO analyses vegetation encroachment to railway tracks using satellite data, giving grid-wide up-to-date overviews of vegetation risk along the asset.

The company has developed an AI vegetation classification system, which then provides a better assessment of risk. The insights are directly accessible through LiveEO's web and mobile app.

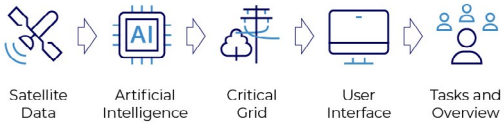
As a result, in many cases, networks no longer require manual, on-site inspections, depending on the software's risk assessment. What was once monitored on foot, by car, or even helicopter can now be recorded and viewed from space. The data used for railway monitoring features spatial resolutions down to the sub-metre range.

The distance between vegetation and the assets is determinable, as are multiple other parameters, all of which improve the risk classification—even the height of trees and trees outside of the right-of-way are captured. Satellite analysis can also determine healthy vs. sick trees. High-resolution and multispectral data allow the system to identify different vegetation species.

Condition-based vegetation management supports the careful removal of trees that present a risk to the operability of any network. Despite this, climate change is unpredictable, and the severity of storms will likely increase vegetation falling into the right-of-way.

From Satellite to Ground Worker

The process from automated data acquisition to the provision of the results is visualised in this image:



The continually updated satellite data is downloaded via API from various satellite constellation operators and combined in a data-base. There, artificial intelligence does the vegetation classification

and performs an automated risk assessment of the data. Based on the risk assessment, the software automatically generates maintenance and inspection tasks and prioritises them.

A web application or mobile app is then used by supervisors and on-site personnel to efficiently access the information and plan work. The in-depth risk assessment makes it easier to prioritise the right tasks. The system goes beyond analytics and allows work orders, which are automatically generated based on the risk assessment, to be assigned directly to the appropriate staff members or subcontractors.

Savings in operational costs using satellite data have been reported to be up to 30%.

Ground Deformation Detection

Detection of ground deformation is another important application of satellite analysis for railway operators. Ground deformation is not visible to the naked eye but can cause significant damage to railway tracks and even lead to derailments. Even slight elevation changes can be the first sign of seriously concerning events such as dam failures or landslides. Most research indicates that half of all train derailments are caused by bent or damaged rails. In the U.S., there are, on average, 3.7 derailments per day. In the EU, there were 68 such derailments in

2016. Not only are these derailments a cause of fiscal concern, but they also come with an increased risk to passengers.

To combat this problem, LiveEO utilises satellite-supported radar data monitoring. SAR (Synthetic, Aperture, Radar) is the technological means used for this process. It can cover massive areas and pinpoint problems down to millimetres. Keep in mind, even the most on-site measurements could not map large areas on a similar scale with comparable accuracy.

The accuracy of LiveEO's solution has been validated on field trips repeatedly © LiveEO GmbH

Monitoring 34,000km of Rail Network for Deutsche Bahn

LiveEO has worked with the German railway operator Deutsche Bahn since 2018. Its 34,000km rail network consists of a dense tree population. Because of a lack of manual solutions to properly analyse the entire network quickly, and a lack of reliable data for determining the appropriate budget, strategy, and personnel management, LiveEO was commissioned to determine the number of track kilometres directly impacted by trees.

Jan Grothe and Dr Richard Lutz of DB AG award Daniel Seidel, LiveEO GmbH, with Jan Grothe and Dr Richard Lutz of DB AG award Daniel Seidel, LiveEO GmbH, with DB's Supplier Innovation Award 2021

The enormous scale of this early client has pushed LiveEO to develop a soltion that can handle vegetation classification for networks on a country-scale with a high level of accuracy and for this LiveEO was recently awarded Deutsche Bahn's Supplier Innovation Award 2021.

ZÖLLNER
signal system technologies

WE DELIVER YOUR TRACK SAFETY SOLUTIONS

Get in touch with us!
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ZÖLLNER

The New Cable-Based Warning Device ZPW126-31 in Action

By Ute Alldieck & Lynn Reinacher

Trains are an effective mode of transportation for covering short and long distances quickly, easily and, most of all, in an environmentally friendly manner.

Both the number of travellers and the amount of freight traffic by rail have started to increase once again. The rising use of the infrastructure along with the growing number of track vehicles result in an expectedly notable surge in track wear. Consequently, infrastructure operators have to invest continued efforts into repair and upkeep in order to ensure that the tracks and the adjacent environment remain in good condition.

Trying to keep the interruption of rail traffic due to construction and upkeep as minimal as possible means only closing track segments on which works are carried out. Traffic on the adjacent track usually continues and might even be higher than normal since one track is not passable for the duration of the works.

The workers performing tasks on or along the tracks often have to pay close attention to their job making them vulnerable to accidentally entering the danger zone of the active track. They thus have to be made aware and warned of approaching track vehicles. In order to always guarantee the best-possible way of warning all workers, ZÖLLNER offers a variety of warning devices. All warning devices adhere to the same principles however: the track vehicle is manually or automatically detected followed by an activation of the warning system. Acoustic signals warn of the approaching vehicle and visual light signals stay active until the vehicle has passed the work zone. Information is transmitted either via cable or via radio.

Radio-based systems are especially useful for short construction sites or those of brief duration.

Image 1 ZPW 126-31

To secure large construction sites that cover long stretches of track (several hundred metres or even several kilometres) and/or take more time, cable-based systems are the most common choice. They have been used for several decades but their use is and has been declining. This is due to the significant effort it took to install previous cable-based systems, especially when compared to radio-based systems. With the introduction of the ZPW126-31 in 2019, which combines the acoustic

Image 2 Several ZPW126-31 on tripods Switzerland

Image 3 ZPW126-31 mounted using magnet fastening

warning device with the visual reminder lights in one compact case so that the deployment of cable-based systems has once again become very attractive (image 1).

The compact warning device only weighs about 8kg, making it easily transportable in any terrain. It was designed according to CENELEC norms, reaches SIL 4 and is failsafe.

Like all collective warning devices by ZÖLLNER, the ZPW16-31 is equipped with an automatic volume adjustment which regulates the level of the warning signal according to the surrounding noise. The result is a warning signal that is always as loud as necessary in order to protect the workers but, at the same time, as quiet as possible in order to protect neighbours and the environment. The 'Autoprowa-Effect' was fine-tuned even further in this new generation of warning devices and is now nearly continuously variable. It is therefore perfectly suitable for noise-sensitive areas as well.

Small green LEDs blinking in all four corners of the warning device show the active status of the warning system. If no LED signal warning device with the visual – neither the yellow warning signal lights nor the green status LEDs – is active, the system is not switched on. Since this allows anyone to see clearly whether the system is active and the worksite is thus secured, there is no need for temporary covers or the like to signal an inactive system.

Examples of the ZPW126-31 in Action

Germany

Image 2 shows the ZPW126-31 on a large construction site in Germany. The device safely warned workers of trains on the adjacent track during works for a track renewal over six kilometres.

Switzerland

The SBB (Switzerland), too, is securing its worksites using the ZPW126-31. Due to the limited space during this bridge redevelopment, the warning device was mounted on the posts of the overhead wires using a separately available magnet fastening (image 3).

The bridge is located in a noise-sensitive area which made the ZPW126-31 especially suited for this worksite.

United Kingdom

ZÖLLNER UK Ltd is working with Network Rail in Scotland to implement the UK's first automatic warning system using the ZPW126-31. The worksite leads across the UNESCO World Heritage Site, Forth Bridge. The historic bridge leaves little space for the installation of a warning system and the compact design of the ZPW126-31 provides the necessary flexibility.

Conclusion

The ZPW126-31 is a compact warning device with versatile application. The nearly continuously variable Autoprowa-Effect makes it especially well-suited for noise-sensitive areas. The quick installation time, the high level of safety along with the integrated LEDs to signal the system's active status makes it state of the art.

After being successfully tested and deployed in several European countries, authorisation for use in other countries is expected to come soon.

YELLOW WINDOW

Our design studio is bound by a shared commitment towards world-class user experiences, innovation, and sustainability. We believe this is the only way to meet the challenges of a changing world.

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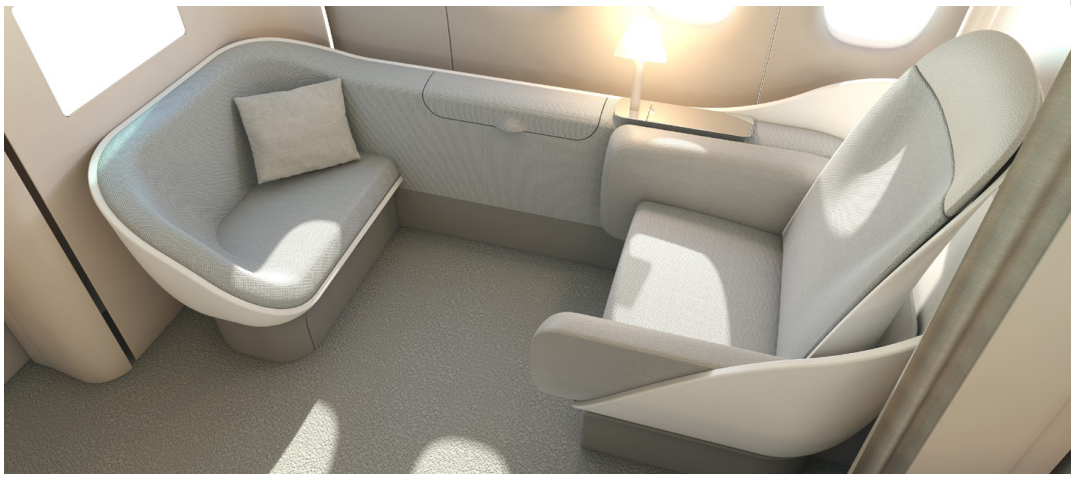

Rolling Stock

Rolling Stock Design & Interiors

Rolling Stock Traction & Power Supplies

Rolling Stock Materials

Camira

1822–2022: 200 Years of Transport Textiles by Camira

Global fabric manufacturer Camira is celebrating 200 years of creating transport textiles this year and, to mark the milestone anniversary, the company has a number of exciting launches, events and promotions set to take place over the next twelve months.

We spoke with Sarah Mallinson, Transport Designer at Camira, to find out what is coming up – as well as to discuss a few of Camira's highlights from the past two centuries.

Q: Could you tell us a little about your 200-year anniversary? How will you be celebrating?

Sarah Mallinson: "We're so proud of our heritage, and this year's anniversary gives us the perfect opportunity to take a moment to pause and reflect on all that we've achieved in the last two centuries – from starting out as a worsted wool spinning mill in the North of England through to our current position as a global supplier with locations as far afield as Australia and North America, and expertise in an extensive range of manufacturing capabilities, it really has been an incredible journey in more ways than one.

We have a few different projects in the pipeline to mark the occasion – one of which is a brand-new capability that will be launching in just a few weeks, and which we can't wait to debut, as it's something new not just for us, but for the industry as whole. Alongside this, we'll be celebrating with customers and colleagues at an event in our London showroom in the early summer – and this will be a great occasion to look back at some of our most famous fabrics and memorable moments, as well as catching up in person after so long spent apart."

Q: With so many elements to the Camira story, what is your favourite part?

SM: "I think one of the most fascinating aspects of our story is how it stretches across the globe – our textiles can be found in railway interiors across the world, and they play such an integral part in the identity, not just of the operator, but of the city in which the line runs. For example, commuters who take

the Paris Metro sit on a Camira fabric, those in London know the TfL tube stations by the Camira fabric featured on each line, whilst passengers in Tel Aviv get around by taking an Israeli Railways train upholstered in a Camira fabric. Some of these relationships stretch back through the centuries, and they are so indelibly interlinked that our fabrics are almost part of the city itself – forming the background to people's memories, as well as their current daily lives."

Q: You're known and loved for your moquette fabrics, could you tell us about that element of your heritage?

SM: "Holdsworth really paved the way for our renowned reputation as a moquette manufacturer – in fact, the company was so passionate and knowledgeable about this type of fabric that in 1909 they became a founding member of the Moquette Manufacturer's Association, and we have continued to champion and perfect this iconic transport textile ever since. It is truly part of our past, present, and future and remains one of our most popular constructions to this day – and, with its wool-rich composition, incredible durability, and irresistible tactility, we can see why customers continue to love it just as much as we do.

Alongside moquette, we also offer an extensive range of other textile constructions – such as wire and flat woven fabrics, pure leather, and high-performance vinyl – so we have really worked tirelessly to ensure that we remain at the forefront of our industry and are able to provide our customers with total upholstery solutions. And, as I mentioned earlier, we'll be adding to our capabilities later this year with the launch of a new technology which will truly transform the way we design and manufacture transport textiles."

Q: With so much design history held within the company, do you ever use these past creations as inspiration for new fabric developments?

SM: "Yes, definitely! As part of our connection with Holdsworth, we have an incredible back catalogue of fabric designs to refer to – the archives literally date right back to the company's foundation in 1822, so there really is an immense number to look back on. From the original fabrics created for The Venice Simplon Orient-Express through to those featured on the Transport for London Underground back in the 1900s, just dipping into these design books not only takes you back in time, it also never fails to spark ideas for new ranges and ways in which we can bring this heritage into a new era.

In fact, as part of our 200-year celebrations, we'll be releasing a collection of Holdsworth designs in contemporary colourways which are perfect for today's transport interiors; they really pay homage to a bygone period, whilst being carefully redeveloped to meet current performance standards and aesthetics. We can't wait to share them with customers, old and new.


200
YEARS OF
TRANSPORT
TEXTILES
EST 1822
Woven into journeys for two hundred years, our beautifully designed, expertly made fabrics have remained a continuous presence in an ever-moving world.
Explore our story at www.camirafabrics.com/200
camira

Yellow Window

The Metro M7 in Brussels - How to Secure Your Design DNA as an Operator

In 2021, the European capital saw the introduction of the new CAF-supplied M7 metro trains. While the project is unique for various reasons, it's significant that the vehicles' industrial design was defined for and with Brussels's public transport operator MIVB/STIB.

The designer, Antwerp and Paris-based studio Yellow Window, highlights this 'design first' approach, in which vehicles are collaboratively defined prior to tendering the project.

Innovating the Design Process in Project Tendering

From a design perspective, metros can be considered highly pragmatic vehicles, born out of rigid tender processes and technical specifications, with attention to end-users often being little and late. And once the procurement formalities are concluded and a vehicle supplier is contracted, any operator with the ambition to modify the vehicle needs to deal with penalties or delays.

Even if exaggerated, disappointing experiences in previous offers

(and projects not quite delivering their promise) led Brussels's operator to boldly decide to specify its next metro generation to include all its design aspects, as an integral part of the technical specifications.

And so, the story of the M7 starts here, in what we call a 'design-first' approach: designing the vehicle concept with the operator and its stakeholders before going to market. Taking procurement along this route requires thorough integration of the design within the vehicle specifications. But return on investment can also start right here: the alignment of all internal processes leading to vehicle specifications, a task never to be underestimated.

And once envisioned, the aspired vehicle concept can be reviewed, co-designed and optimised with internal or external stakeholders. This 'testing' can range from the pragmatic (the optimal door width or layout options) to emotional aspects such as styling, shape and identity.

The Ambition behind the M7

Developing a tangible design vision upfront was also the surest way to further carve out the operators' unique design DNA and to guarantee its faithful materialisation in the project. Centring around the user, MIVB/STIB's objective was to set new standards in quality and experience – to ultimately persuade more citizens towards sustainable transport.

Striving for a harmony with the environment and deep respect for the user, this translated to very un-metro-like styling cues of organic, elegant shapes and noble materials, reflecting Brussels's Art Nouveau heritage. The resulting interior is quite unique in this sector. Atmospheric and inviting, but also offering travellers diverse choices in seating: longitudinal or transversal directions, individually or together, quietly, or close to an exit with numerous folding seats.

To realise the high level of ambition, the design concept had to have sound foundations. User research and service design techniques preceded the design stage, and clear performance goals were set to improve on earlier generations. This for instance led the design to facilitate more efficient and flexible use during the rhythms of the day, or to optimise entrances and door widths for accessibility and (real world) capacity during peak hours.

In the case of this project, the design was expanded over detailed vehicle specifications. The design stage resulted in a virtual mock-up, allowing for more realistic evaluation. Upon

procurement, a clear visual specification was shared with the industry, including 3D CAD files. On return, each of the three offers submitted closely answered the design intent. Exchanging 3D files from bid stage on improved the offer evaluation and later the follow-up and co-operation during the industrialisation phase with CAF.

Harmonising the Brussels PT Fleet

Building, upgrading and harmonising a fleet of vehicles in a metropolis is a matter of generations. Yellow Window has been supporting MIVB/STIB in innovating and upgrading its fleet in Brussels for nearly two decades. With the introduction of the M7, as well as the new TNG Flexity tramway, different generations and types of vehicles are slowly but surely harmonising towards a high-end appearance worthy of the European capital. A fleet with a unique level of coherence in design and identity, materialised in colour and materials as well as 3D design language.

Different train operators have a history of designing their rolling stock. It can also work for a metropolitan operator, provided that the design respects standards and answers what the industry can deliver. The investment in this approach was justified by the operators' level of ambition, as well as by the determination to see their envisioned design DNA fully realised this in procured vehicle. The continuity and determination it takes are a testimony of great commitment from both the operator and its suppliers – and all within stretching to great lengths in realising these dreams.

YELLOW WINDOW

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Skeleton Technologies

Supercapacitors in Light Rail – 30% Energy Savings with KERS

In 2020, the Covid pandemic caused a decrease of about 6.4% in global carbon dioxide emissions, dropping the levels of greenhouse gas emissions to the level required to reach the Paris Agreement targets.

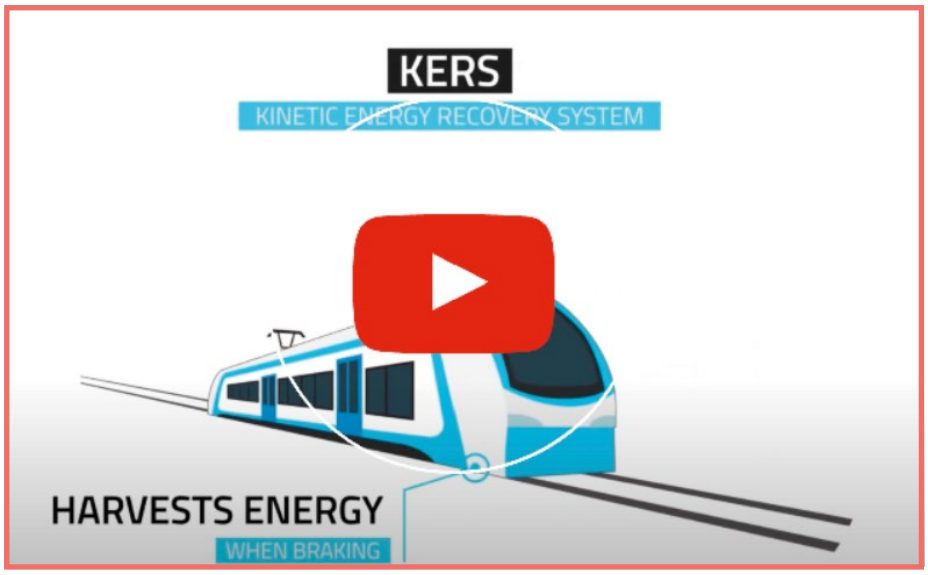
Unfortunately, the decline in emissions did not last long and by the end of 2020, **concentrations of the major greenhouse gases continued to increase**. As we start to come out of the pandemic and industry is ramping back to pre-Covid production levels, it serves as a good reminder of the scale of change necessary to stop or at least reduce the impact of climate change.

Change is almost always incremental, and it might be difficult to always be aware of how much progress we have made in a number of industries, rail included. Energy efficiency is one of the key criteria in any new rail project and the rail industry has done a significant amount of work already to reduce emissions

in the European Union, **with CO2 emissions dropping from 12 million metric tons in 1999 to just under 4 million metric tons of CO2 in 2019**. However, with global emissions still on the rise, and the Covid pandemic's impact seemingly and perhaps unsurprisingly not lasting, there is still a lot of work to be done.

At Skeleton Technologies, we are working with a number of light rail OEMs, supplying top of the class supercapacitor energy storage mainly for Kinetic Energy Recovery Systems (KERS) and peak shaving. With our first-generation SkelMod 51V supercapacitor modules, we've been able to decrease energy consumption and related carbon emissions by around 30% for a number of our customers by collecting braking energy and re-using for acceleration.

With our upcoming second-generation products, powered by our patented Curved Graphene raw material, the energy savings have the potential to double. These products are already being tested by some of our long-term customers and we are getting excellent feedback on the performance of the products. We are already working on further improvements on the key issue with supercapacitors – energy density. Our third-generation energy storage technology, the SuperBattery, will reach ten times the energy density of current supercapacitors, while maintaining high power and long lifetime.



Tobias Ragnarsson, Sales Director for the rail, transportation and heavy equipment sectors at Skeleton, highlights: *"The importance of trams in European cities is increasing with the push to reduce congestion and pollution, especially in larger urban areas. While trams are already a very energy-efficient method of public transportation, there are always ways to further reduce energy consumption and improve efficiency. Our first-generation supercapacitors, in the rail industry specifically the SkelMod 51V module, are offering 30% energy savings, and our next generations can increase savings and CO2 emissions even further, so we're living very exciting times. Last year we also received a rail certification for the SkelMod 51V module, which makes it the only rail-certified supercapacitor module on the market."*

In addition to the KERS and peak shaving applications, we're also working with a number of customers on wayside energy storage and catenary-free solutions, and of course engine cranking – an application supercapacitors are perfect for due to the high power and more than one million lifecycles the technology offers.

30%
Energy savings

Tobias Ragnarsson
Sales Director – Transportation

tobias.ragnarsson@skeletontech.com

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by capturing braking energy and re-using it for acceleration.

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Texelis

Delivering Traction Systems in the Americas

Texelis, world leader in traction systems for rubber-tyred metros and tramways, has new ambitions for its co-operation with Mexico City Metro. Both as an OEM producer and turnkey services provider.

Texelis in Mexico:

20 years of collaboration in modernising Mexico City's fleets. More than 2,000 traction systems already supplied. Serving NM02 and NM16 rolling stocks for lines 2 and 7.

In 2021, Texelis was awarded a 2-year contract to supply 1,044 axles to CRRC Zhuzhou for Mexico City Metro Line 1.

Laurent Garnier, General Manager Transport systems, Texelis: *"Mexico City Metro has always been a key market for Texelis development on the rubber-tyred division. Mexico is also allowing us to partner with new rolling stock manufacturers such as CRRC and become a long-term player in their supply chain, hence opening new doors for future collaboration.*

Texelis also sees Mexico as a key industrial base for a possible manufacturing site for street cars, trucks and traction systems to better serve our US and Canadian transit systems."

The Texelis Mexico branch was established in 2021 to strengthen the special relationship enjoyed by the two entities. This will allow us to offer the best local support and get access to local tenders. The local entity will act as a key OEM and services supplier to the metro.

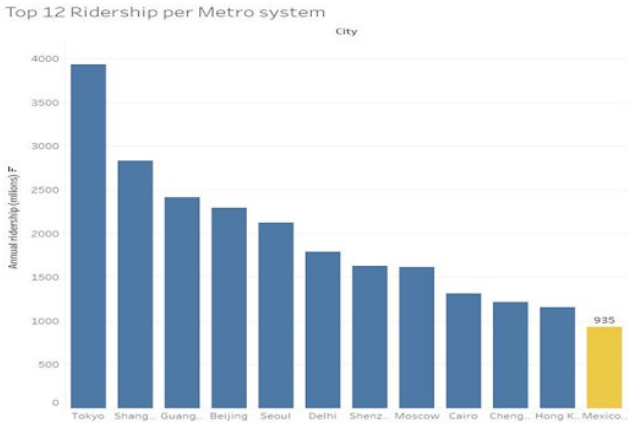
Texelis has a commitment to help Mexico City Metro to extend existing bogie lifecycles and adapt the traction systems to the older rolling stock.

Texelis proudly supports 13 local engineering universities through a local partnership in technical research.

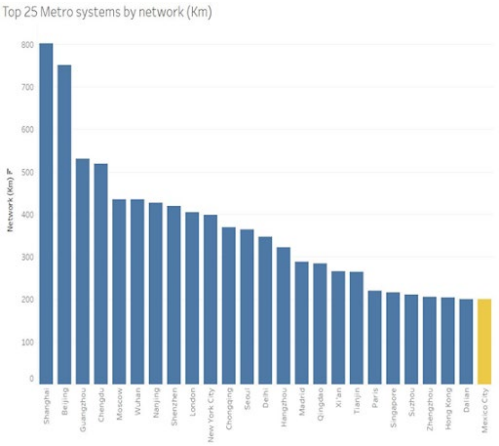
Contributing to creating Mexico's railway engineering forces of tomorrow is a commitment we wanted to make to ensure a win-win collaboration in the country.

Texelis is very active within the Americas and has a strong presence in most of the continent's countries. Running urban rail networks is a real focus for Texelis. To offer the best maintenance solutions, Texelis has developed a local partner network.

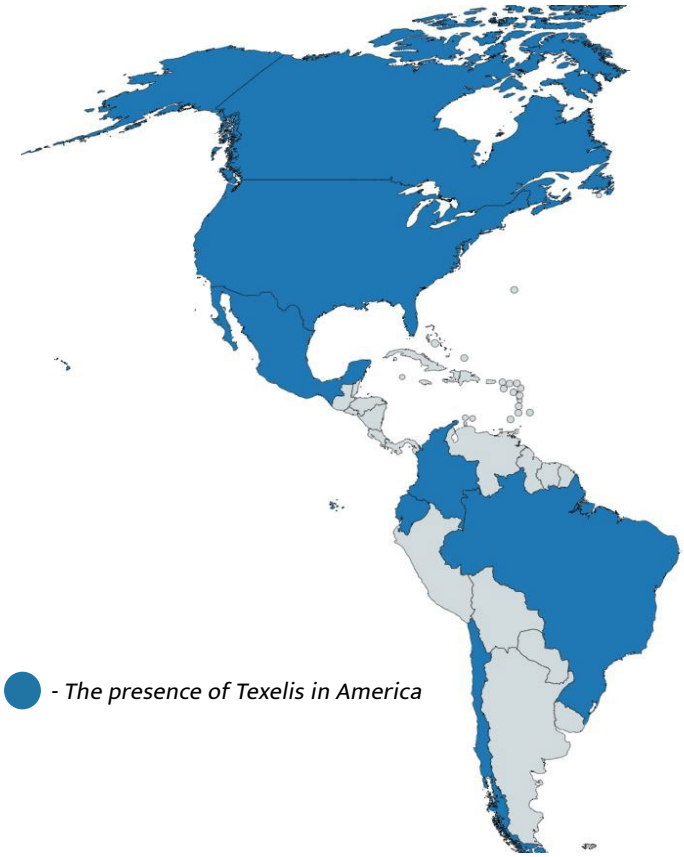
As a result, Texelis has been growing its presence in transit



Mexico City Metro is 1st in America in terms of ridership (12th in the world)



2nd in terms of network size – only to NYC – in America (25th worldwide)



- The presence of Texelis in America

systems in America:

- Chicago
- Mexico
- Montreal
- Santiago de Chile
- Cuenca
- Rio de Janeiro
- Medellin
- Ottawa

Texelis helps transit agencies with their streetcar traction systems overhaul and modernisation.

The Texelis commitment to our customers:

- to help US and Canadian transit organisations extend their current fleet lifecycle up to 30 years
- to reduce ownership and maintenance costs
- to improve safety, reliability and the streetcars' end user experience

An issue with your streetcar fleet's traction system? A planned overhaul project?

Contact Texelis, we're here to help!

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TEXELIS

Capitol Industrial Batteries

Any Application – Not Just Any Battery – The Perfect Power Solution!

Here at Capitol Industrial Batteries, we have operated as an independent battery manufacturer sales and service centre since 2001.

We have the background, knowledge and ability to meet any customer's requirements and we can supply and overhaul Ni-Cad, wet lead acid, gel VRLA maintenance-free and lithium battery types whilst also offering bespoke manufacturing for specific client needs.

We pride ourselves in our ability to support the market through investment in our stock holding facility as a core part of our business model which allows us to deliver products more quickly than our major competitors.

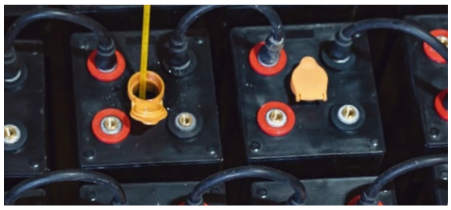
CAPITOL INDUSTRIAL BATTERIES makes, supplies and services a comprehensive range of batteries and is fully aware, committed and engaged in supporting the evolving market in terms of the electrification and decarbonisation agendas, which are major themes in most organisations at present.

Our knowledge of battery technologies futureproofs our continued ability to supply and service any product type to support the long-term operation of alternative fuel-powered trains.

For more than two decades we have been acutely aware of the need for localised battery production within the UK, which is why we continue with the final assembly and commissioning of our products here in Cumbernauld, near Glasgow. We also have a full maintenance and overhaul facility in Birmingham – something we pride ourselves on.

We have the full backing of our manufacturing partners who have supported this area of our business by providing technical development of our products to ensure they are a safe and reliable option for any and all types of rail vehicles.

Our bespoke customer-focused level of service from manufacturing through to project consultation and close collaboration means that we can tailor the correct battery option from our dedicated product range for use in all rail applications.



capitolindustrialbatteries

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

As a modern family-run company now in its third generation, the safeguarding of the head office is just as important as our worldwide sales and our international subsidiaries and partners.
The product range of Europe's leading system coating provider covers the entire spectrum from industrial coatings, powder coatings and electrodeposition coatings to composite solutions.

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

Environmental protection has always been a key priority for **Frei**Lacke.
Therefore, the company makes every effort to develop environmentally friendly products, reduce emissions, packaging materials and waste and use resources sparingly.

Applied **solutions.**
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Our solutions
at a glance (video).

Our solutions
at a glance (brochure).

SINTRONES

Intelligent Transportation Systems

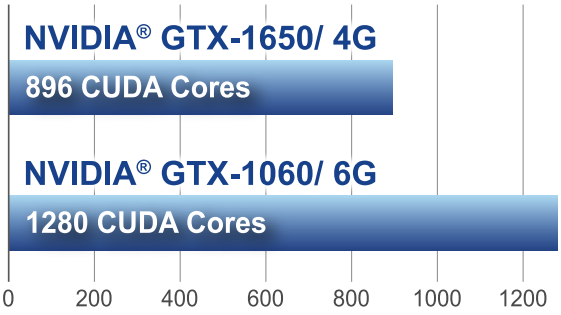
Certified Fanless Computer

- 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.

NVIDIA CUDA **NVIDIA®GeForce Option**



SINTRON Technology Corp.

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Services

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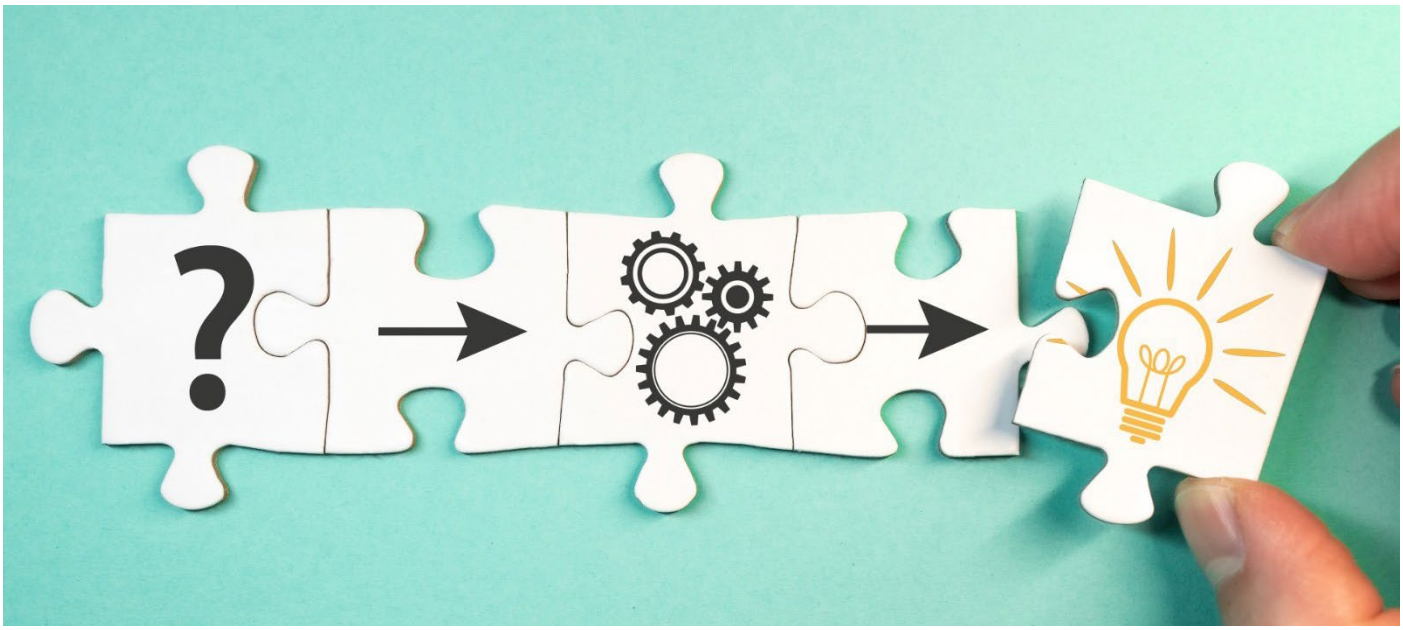
Xenia

Innovation and Flexibility: Values to Look for in 2022



Specialised in the travel industry since 1992, Xenia SpA SB is accustomed to the needs of the railway sector as well as airlines, shipping lines and cargo operators.

Xenia has consolidated experience in the hotel and service accommodation field and provides services such as worldwide hotel scouting, negotiation and drafting of contracts, operational management and 24/7 customer 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
- provide effective responses to any request – from urgent enquiries to long-term 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

These services can benefit rail companies, airlines, airports, operating companies and carriers

in terms of economies of scale, purchasing expertise, market insight, data collection and market intelligence – on top of which a customer-oriented team ensures clients always receive the maximum value.

Beyond the benefits, a common element that the travel industry would require in this climate of uncertainty due to Covid restrictions is flexibility and innovation.

Since the start of Covid-19, the transport segment has been significantly affected and the constant ups and downs of the pandemic require a new approach that challenges the pre-pandemic models.

Even in a context of limitations caused by the Covid pandemic, our company was able to provide flexible solutions to the requests of the transport industry.

Research shows that there is willingness to start travelling again. Consequently, it is necessary to adapt to these new circumstances and provide our clients with effective and efficient solutions. At the same time we are pursuing sustainability as a company value which we make sure to apply to all services and models.

In this regard, studies have shown a growing sensibility of passengers towards the environment.

We can't deny the global pandemic probably has and still will affect models of supply and demand.

For this reason, Xenia SpA SB aims to provide the required services while providing flexible and up to date solutions to its clients. With its 30-year presence in

the travel industry, Xenia has preserved and strengthened its dynamic identity by attentively observing the changes and the needs of businesses and also by becoming promoters of new paradigms.

The adaptability that has always distinguished our company from others allowed us to keep up with the needs of our clients.

The expertise and the know-how in the hotel industry, as well as the service system based on CRM, also allow Xenia to support businesses at maximum levels of personalisation.

Our company is made of people, for people.

It knows the meaning of hospitality and wishes to reserve customers the attention they show to their guests. Listening to their requests, understanding their requirements and knowing how to establish a fruitful dialogue is the first step in order to be able to truly propose solutions.

VUZ

Czech-Based VUZ Plans to Expand Its Inspection Services throughout Europe

Výzkumný Ústav Železniční (VUZ), one of the most renowned accredited railway testing institutions in Europe, will now expand its services to include inspections and evaluations of railway construction projects throughout Europe.

The company's recent achievement of CDP environmental certification and its commitment to reducing its carbon footprint is further proof of VUZ's determination to become a leading partner of the most reputable European rail companies. The expansion to European markets is part of the extension of VUZ's services, and its first branch has been opened in Slovakia.

Evaluating Railway Infrastructure Construction Projects

VUZ is a European notified body for evaluating and inspecting railway infrastructure construction projects, and it is one of the most in-demand institutions for the certification and inspection of railway construction

in the European Union. VUZ is one of the three largest issuers of certificates in the EU with a massive portfolio of projects evaluated, from the design phase to the final inspection of a completed project and its conformity with technical standards. VUZ most often evaluates projects in the Czech Republic, but also in Slovakia, Bulgaria and the Baltic States, and now VUZ has offered its service to notified entities in other countries VUZ's major advantage is its massive technical foundation in the Cech Republic and the overall lower costs of the entire evaluation process while providing the highest level of safety, accessibility, technical compatibility, and other fundamental points that every modern rail project must fulfil. VUZ always offers its partners specialists that can evaluate and certify railway infrastructure, energy and the management and safety of operations anywhere in the EU, and specifically they can oversee the implementation of the ETCS.

VUZ's Corporate Responsibility and Its CDP Score Report

VUZ is also a partner on the path to a greener Europe. It is one of only five Czech companies to undergo non-profit group CDP's rigorous environmental impact evaluation. VUZ received an excellent C rating, and it's the only railway or heavy industry company in the CEE to achieve such a result.

VUZ is not only actively reducing its environment impact and its carbon footprint, but it's also taking specific steps to make its operations carbon neutral. VUZ's customers already use solely green energy, and the

company also holds ISO 50001:2018 energy management certification. Furthermore, VUZ is preparing several sustainability projects, including its own photovoltaic production at all its facilities, leveraging the maximum of recuperated energy from the tests of rail vehicles, and our own energy self-sufficiency projects. We have also adopted a responsible waste management policy.

The health and safety of our employees is of the utmost importance for VUZ, and the company maintains the highest standards to stay on the path to zero work-related accidents. VUZ is preparing its own hydrogen power study that in the future will serve our customers when testing hydrogen-powered trains and VUZ itself as part of its energy self-sufficiency projects.

Every VUZ partner can rest assured they are working with an institution located in the heart of Europe with easy accessibility that takes its responsibilities to the environment and its employees seriously while using the most advanced technologies and offering its services all 365 days a year.

VUZ Slovakia

The Czech-based Výzkumný Ústav Železniční has launched its expansion abroad, founding its first foreign subsidiary in Slovakia. It will be a launch pad for the company's expansion throughout Europe, and VUZ will enter other markets in the coming years.

VUZ is a notified body (NoBo) for all railway subsystems including infrastructure, energy, track and on-board controls, and security for railway vehicles throughout the European Union. Its goal is to be a leader in its field along with established European brands such as TÜV and SGS.

VÝZKUMNÝ ÚSTAV ŽELEZNIČNÍ, a. s.

A European Leader in Rail Transport Testing

- Railway vehicle testing
- Dynamic component testing
- ETCS testing
- Interoperability assessments
- Safety assessments
- Accredited certifications

- 17 km of railway test tracks
  - Covered by GSM – R signal
  - Equipped with ETCS L1 and L2 signalling systems
  - All major European power supply systems supported
- 10,000+ vehicles tested
- 1 500+ certifications issued
- 50 years of experience

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ORBIS
CELEBRATING 20 YEARS
EST. 2000

ONE SIZE DOES NOT FIT ALL

WHAT WE PROVIDE

BENCH TEST EQUIPMENT
ORBIS develops bench test equipment for ensuring critical assets are in a good state of repair.

R&D TEST STANDS
ORBIS helps Tier 1 and Tier 2 suppliers bring products to market faster by providing automated test systems for product verification and validation.

ENGINEERING SERVICES
ORBIS provides reverse engineering and design services to help organizations overcome obsolescence challenges and extend program lifecycles.

CUSTOMIZED BENCH TEST EQUIPMENT (BTE) SOLUTIONS FROM ORBIS

Building on a scalable hardware and software platform, ORBIS Flexible BTE solutions are fully customized for each Line Replaceable Unit (LRU) or Circuit Card Assembly (CCA). Our guided setup and diagnostics reduce or eliminate the need for external documentation and enable technicians to repair units in the field and lower maintenance costs.

SOLUTION BENEFITS:

- Test multiple LRUs and CCAs on a single tester
- Easy-to-use with guided troubleshooting and repair
- Add or modify tests without programming
- Connectivity with enterprise databases and asset management software

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ORBIS

A Proactive Approach to Managing Test System Obsolescence

The Problem

Managing automated test equipment (ATE) obsolescence is a common and persistent challenge in the railway industry. With locomotive and railcar lifespans exceeding 25 years, the equipment used to test and maintain critical components must keep pace. But how do you accomplish this when the service life of most test and measurement equipment is typically less than 10 years? A recent review of one transit authority ATE revealed that 80 percent of the system components were at or nearing end of life after nine years in service.

Unplanned downtime of testing assets can significantly impact a transit authority or supplier's ability to carry out proper testing and maintenance of critical rail components. When a test system fails, the length of downtime can vary from hours to months depending on several factors including the availability of replacement hardware.

Where fit, form and function replacements are no longer available, getting a system up and running may require significant design changes. Additionally, systems that use proprietary hardware or communication protocols may require the support of the original equipment manufacturer (OEM) or reverse engineering if a company is no longer in business.

In this article, we will explore proactive strategies to extend the lifespan of ATE and ensure uninterrupted test coverage throughout the lifespan of the programme.

ATE in the Mass Transit Industry

ATE in the transit industry is often referred to as BTE, which is short for bench test equipment. These systems are used by maintenance personnel to perform full functional testing and troubleshoot problems. For complex electronic devices such as brake controllers, BTE systems often allow technicians to diagnose problems to the lowest line replaceable unit (LLRU). A typical BTE consists of test and measurement (T&M) instruments such as digital multimeters, oscilloscopes and function generators as well as hardware needed to communicate with the device under test (DUT). Of course, software is the glue that holds everything together.

Designing for Obsolescence

Proper planning for test equipment obsolescence begins in the early stages of design. The use of commercial-off-the-shelf (COTS) hardware is a proven strategy for minimising risks. Choosing hardware from vendors with a track record of product quality helps customers overcome obsolescence. Leading T&M companies have defined lifecycle policies and offer services to extend the lifespan of instruments.

Another strategy is to select modular hardware that can

be sourced from multiple vendors. PXI (PC eXtensions for Instrumentation) is a common form factor. A PXI-based system consists of a chassis, controller and modular instruments. PXI has been an industry standard for more than 20 years and it continues to grow.

The choice of software platform is also an important consideration for managing BTE obsolescence. Choosing an industry standard software platform with a large install base will ensure that the test software can be upgraded for many years to come. National Instruments LabVIEW, Microsoft .NET and Keysight's PathWave Test Automation are good examples.

Regardless of the development environment, it is best to choose an integrator with experience developing modular and scalable software architectures. A modular approach and coding techniques such as hardware abstraction will allow instruments to be replaced or upgraded with minimal changes to the software. Also, it is a good idea to ask your integrator about options for upgrading the system software in the future.

Developing an Obsolescence Plan

In addition to selecting the right hardware and software, developing an obsolescence plan allows you to proactively manage risks rather than reacting to failures. The obsolescence plan identifies at-risk components and outlines actions to be taken based on the consequences of a failure. Risk increases with age and the plan should be updated regularly based on the current lifecycle status of system hardware.

System Upgrades

Waiting until a failure occurs is not an effective strategy for managing obsolescence and proactive planning is the key to minimising downtime. Performing incremental upgrades over time, rather than a complete refresh, puts you in control, reduces downtime and facilitates budget planning.

Periodic and scheduled upgrades also provide opportunities to insert new technologies or add new features. This is important if your testing needs change. It is also a good time to consider whether it makes sense to consolidate test equipment. For example, can the system be upgraded to test additional products?

Call to Action

If your organisation relies on test equipment that is more than five years old, now is the time to act. The first step is to determine the lifecycle status of critical T&M hardware. The system provider can help and you can also contact the instrument manufacturers for the current lifecycle status, last time buy dates, and recommended replacements.

Keep in mind that hardware changes may also require software and electrical design changes. While the upgrade costs may be significant, the cost of an unplanned failure and extended downtime may be far greater.

Contact a professional system integrator if you are unsure of how to assess the risk and develop a plan to overcome obsolescence challenges. Companies like ORBIS, an engineering solutions company and BTE provider, will provide a free obsolescence analysis.

Visit **orbisinc.net/masstransit** to learn more.

ORBIS

Element Materials Technology

Vibration Behaviour of Complex Structures

Element and Rolls-Royce have joined forces in a unique collaboration to offer their vibration testing services to a wide range of industries from aviation and automotive to rail and oil and gas, all of whom can now benefit from their extensive experience in testing and evaluating the vibration behaviour of complex structures.

An Essential Tool in the Design, Development, Certification and Qualification of Products

Vibration testing of complex structures, such as jet engines, is an essential tool in the design, development, certification, and qualification of products and components. It allows lessons to be learned from the vibration behaviours that manufacturers can apply when designing new products or structures, giving them a much more transparent estimation of areas that might generate potential issues and a much higher chance for 'right first time'.

Used to ensure that products or components are robust and perform safely during operation or transit, **vibration testing** mimics the conditions that a complex structure might see during its lifetime while under a test environment, detecting performance issues and potential failures before they commence.

The complex stresses that occur during the operation, or transportation, of technical structures must be examined under static and dynamic operational loads to assess the impact of fatigue and to determine accurate in-service life predictions. **The Rolls-Royce state of the art vibration laboratories** based in Dahlewitz, Germany feature electro-dynamic and servo-hydraulic systems that can replicate both low and high-frequency conditions. The team carries out vibration testing, including structural analysis and data evaluation, by using cutting-edge control systems to test the component or complex structure against specified test levels and performs field data replication to understand precisely how the test item is affected.

In combination with Element's global facilities, the team has access to some of the world's largest dynamics systems for shock and vibration testing. This enables the testing of products with a large footprint, high centre of gravity and off-set loads and provides manufacturers with a high level of scheduling flexibility.

Understanding and Selecting the Most Appropriate Vibration Test Methods

Using its expertise, the team selects the most appropriate vibration test methods and procedures to accurately

replicate the environmental conditions and in-field vibrations, whether structure or airborne, for a product or component. Understanding each method's different approach and benefits is critical when selecting which vibration test methods to apply to analyse the structural behaviour. Techniques that may be employed include:

Modal Testing and Modal Analysis for Components and Complex Structures

Modal testing is an experimental means of determining the dynamic characteristics of a structure through mechanical excitation, created by vibrational or impact methods. This excitation creates the mode shapes of the component or complex structure. Measured by accelerometers, the data can then be analysed to develop the structure's dynamic structural characteristics.

Modal analysis helps to determine the vibration characteristics, such as natural frequencies and mode shapes, of the mechanical structure or component, showing the movement of different parts of the structure under dynamic loading conditions. It converts the vibration signals of excitation and responses measured on a complex structure that is difficult to perceive into an easier-to-understand mathematical model or set of modal parameters. A non-destructive test method, operational modal analysis, can be carried out for in-situ measurement of systems in operation.

Computer-Based Model Updating for Finite Element (FE) Structure Models

Rolls-Royce and Element's **Finite Element Analysis (FEA)** experts use computer-based modelling to analyse the strength of complex structures and systems, determine component behaviour, and accurately predict how products will react under structural and thermal load.

The FE analysis experts work closely with the physical testing team to suggest solutions to client test failures and validate the physical testing simulation.

Mode Shape Analysis

Mode shape analysis (MSA) uses a scanning laser doppler vibrometer (SLDV) to provide the data needed to understand the different shapes that can be taken up by the structure during different modes of vibration. Each mode shape has its own corresponding natural frequency, which indicates how the structure behaves under a dynamic load.

3D SLDV Mode Shape Analysis and Strain Measurement, Including Stress Calculation

Analysing motion within 3D parameters is the final step to achieving the big picture of the dynamic behaviour of a component or structure part. For 3D mode shape analysis, the 3D SLDV MSA or the 3D Digital Image Correlation (DIC) by video systems are established methods.

The team can examine the vibration behaviour of highly complex structures with 3D Digital Image Correlation, a 3D full-field, non-contact optical technique to measure contour, deformation, vibration and strain on almost any material. This can be extremely useful for intricate pipe systems, reducing the need for multiple strain gauges.

Strain Gauge Calibration

Strain gauges are used to measure static and dynamic loads in field operations.

With the FEA (Finite Element Analysis) strain results and the operational service measurement analysed strain values, the fatigue lifetime or fatigue resistance could be evaluated.

Vibration Testing of Rigs

Fatigue testing measures how cyclic forces will affect a product or material over time, using varying loads, speeds and environmental conditions. Our fatigue test methods, like high cycle fatigue (HCF), are useful for simulating specific scenarios and investigating real-world failures.

The Rolls-Royce and Element equipment allows a very high number of cycles to be run in a short amount of time, simulating a component's service life. HCF tests are usually response-controlled and typically run to one million or more cycles. Testing continues until specimen failure or until a predetermined number of cycles is reached. Once cracking starts to occur, the failure cycle count is recorded, and the component is analysed for performance characteristics and durability criteria.

Defining Requirements and Developing a Comprehensive Test Plan

The Rolls-Royce and Element team of vibration experts can help manufacturers to define their requirements and develop a comprehensive test plan tailored to fit their specific needs. The team combines multiple test methods to create a single, complete programme that ensures product safety while saving time and money. The team's expert knowledge of the different methods of analysing the behaviour of complex structures allows for many of the procedures to be planned and executed in ambitious timeframes. Following the tests, detailed professional test reports can be provided to include in certification packages.

For more information on vibration testing and understanding the vibration behaviour of complex structures, please contact us.

element

Bidvest NOONAN

Keeping Our Railways Cleaner and Safer

Bidvest Noonan supply over 55,000 hours each month to the rail & tram sector and work with many of the largest transport operators in the UK.

By applying award winning solutions we ensure that our client's unique and often demanding requirements are met day after day. We are committed to providing the best possible passenger experience and delighting our customers.

Our Cleaning Services Include

- Periodic Heavy Cleans (PHC)
- Turnaround Cleans
- Sanitisation & Disinfection
- Exterior Vehicle Cleaning
- Depot & Premises Cleaning
- In Service Cleaning
- Specialist Cleaning

Our Security Services Include

- Revenue Protection
- Personal Track Safety (PTS)
- Specialist Rail Crowd Control
- Gateline Operatives
- Suicide Prevention
- Train Despatch
- Enforcement

To find out more please contact:
Stuart Cunningham: 07973 634563
Deborah Mills-Burns: 07923 238091

bidvestnoonan.co.uk

Bidvest Noonan

Cleaning, Security and Support Services for Rail

Bidvest Noonan has launched a new specialist business unit focusing on the transport sector in Great Britain.

Bidvest Noonan substantially increased its position in the transport sector by acquiring Cordant Services, a business with an extensive client portfolio and decades of experience supporting the sector. Today, the company supports many of the UK's largest bus and rail operators and is a market leader for cleaning, security and support services. Colin Marshall, a long-serving member of the Cordant Services Leadership team and a transport sector expert, has been named Managing Director for the new business unit.

Operating nationwide across the UK, Bidvest Noonan estimates that it supports over 1.5 billion journeys annually. The services it provides to clients in the transport sector include cleaning, security, shunting, refuelling, sanitising and many more. The business aims to cement its leadership position in the sector and establish a strong platform for its continued growth and development.

Managing Director Colin Marshall said, *"I am delighted that we are investing in our transport sector business, and I am honoured to lead this business as Managing Director. We have built the expertise, resources and infrastructure we need to provide world-class value and support to our clients."*

Supporting the Public

As people go back to work and we enter a time when travelling

numbers continue to rise, we recognise that the public transport network is critical to our country. We will continue to be there for our customers and the public 24/7, making the vehicles, stops, stations & facilities across the network operate in safe & clean working conditions.

We continually electrostatically spray and fog each of the thousands of vehicles we clean ensuring they have the maximum protection against COVID-19. We also carry out a range of Touch Point Cleaning to ensure all high-traffic areas and most commonly used surfaces, like handrails and ticket machines, are continuously cleaned to ensure the safety of all passengers on the networks we support.

Driving Innovation Across the Industry

Due to the unique flexibility of our industry-leading portal, MyBidvestNoonan, we have adapted our data capture capability to integrate the new processes and techniques that we now deliver in this post-COVID world to ensure our solutions continue to measure, monitor and give our customers real-time data.

We have been stepping up our game when it comes to helping out the environment and combatting climate change. We have introduced a range of measures including our chemical-free cleaning technology and have increased the use of our 'green' chemicals; cleaning chemicals that are much safer for the environment.

The Way We Work

In everything we do we follow our credo. It is:

- **People First**
Putting the wellbeing of our colleagues at forefront of everything we do.

- **The Basics**
We know doing the fundamentals well, every time, is key to high performance.

- **Earn Trust**
Being trusted is the greatest compliment we can receive and we work hard, with every action, to achieve this.

- **Adaptive & Agile**
We know the needs of our customers change. We are always ready. We plan, we respond, and we perform at pace.

- **Imagination**
We are not followers. We imagine new ways of working and design solutions that create value.

- **Social Value**
We have a duty of care to our planet and the communities we operate in. Everything we do should be sustainable and add value to society.

With these foundations and our continued growth we hope to build on our success and continue to provide a first class service to all of our clients and their passengers for years to come.

Find out more:

bidvestnoonan.co.uk

Bidvest NOONAN

a2b Global Media

Our Brands

a2b Global Media Ltd is an online publishing company specialising in the transport sector. Through our brands – Railway-News, Airport Industry-News, Bus-News and Future Transport-News – we provide readers with the latest developments in those transport sectors via our websites and quarterly magazines. Readers will also get detailed information about industry events and above suppliers providing products & services to the transport sector. The aim of our brands is to be a one-stop-shop resource for readers and give suppliers the all-important reach they need to feature their activities.

Transport is the backbone of society. We're here to cover it.

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