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InnoTrans 2026 Report

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FOCUS

RAILWAY INFRASTRUCTURE

Pioneering concepts for railway infrastructure

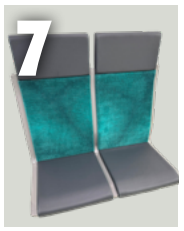
Technologies such as digital monitoring, automated construction processes, AI-supported ventilation systems, sustainable under-ballast mats as well as virtual training platforms ensure sustainable efficiency, quality and safety in railway operations.

InnoTrans debuts in Asia

InnoTrans Asia will celebrate its premiere in Singapore in 2027. Every two years, and with a clear focus on the Asian growth market, the new trade fair will give players in the railway and mobility industry a chance to meet.

Sustainable rail in Norway

Norway is modernising its 4,200-kilometre rail network and over 400 trains with digital control and signalling technology. The large-scale project aims to increase efficiency and significantly reduce CO_2 emissions in transport.



Seats reimagined

Sustainability on the rails: Seats for the Cologne S-Bahn were modernised in line with circular economy principles, components were reused and recycling processes were implemented – thus reducing waste and the carbon footprint.

Computer based interlockings: Pioneers of a new railway control system

Central control interfaces in the Donauwörth digital signal box Photo: Deutsche Bahn AG/Dominic Dupont

Computer based interlockings (CBI) are considered a key technology for the transformation of railway infrastructure in Germany. Their innovative control architectures enable more efficient, reliable and predictable operations.

While solid state interlockings (SSI) control turnouts and signals via classic electrical circuits and often kilometre-long cable connections, CBI technology is based on a fully digital communication architecture. Control commands are transmitted via IP-based fibre optic cables to field elements such as switches and signals. The technology enables complete modularisation, standardisation and decentralised control. Updates and adjustments to software and hardware can be carried out without extensive modifications.

Remote diagnosis, modularity, staff efficiency

The introduction of digital interlocking technology offers numerous technical and organisational advantages. Remote diagnosis allows operating conditions and fault patterns to be analysed and rectified in real time. Maintenance intervals are thus reduced and reliability is increased. The modular design of CBI allows existing systems to be modernised step by step and facilitates the integration of new components. The automated processes and centralised user interfaces help to reduce the number of staff required. At the same time, modern redundancy concepts ensure increased operational reliability and fault resistance, as failures of digital components can be quickly detected and compensated for.

Innovation and implementation

In Germany, the Annaberg-Buchholz CBI and the Emden–Oldenburg large-scale project are considered trendsetting pilot projects. The Annaberg-Buchholz digital interlocking began operation in 2018 as Europe's first digital interlocking and marks the starting point for the nationwide implementation of this generation of technology. It is exemplary for the digitalisation of control and signalling technology and serves as a reference for its gradual nationwide implementation to the German railway network.

Server room in the Donauwörth digital signal box Photo: Deutsche Bahn AG/Dominic Dupont

The Emden–Oldenburg CBI is being implemented on an approximately 120-kilometre-long main line. It is considered the first project in the north-west to control a central artery in extensive real-world operation, which is of crucial importance for long-distance passenger transport as well as for the rapidly growing freight traffic to North Sea ports. Digitalisation will enable higher train frequencies, denser timetables and more reliable capacity utilisation. Siemens Mobility, Alstom, Thales and voestalpine SIGNALING are major contributors to its implementation, supplying components and control architectures for operation and implementation.

Skilled labour shortage and delivery times

It is not only a lack of skilled workers that is slowing down the implementation of digital interlockings. Lengthy planning and approval procedures as well as delays in the delivery of technological components are also extending the duration of projects.

Erzgebirge CBI – a digital showcase project

With its innovative cloud integration and digital field elements, the Erzgebirge (Ore Mountains) CBI in Annaberg-Buchholz, exemplifies the performance and flexibility of the CBI approach. In addition, a 'real-world test laboratory' for digital railway operations was created for the first time in the Erzgebirge, where new software and hardware solutions from manufacturers are tested, operational processes are simulated, training is provided and continuous optimisation takes place. The interlocking thus also serves as a training and further education location for skilled workers. Since it went into operation in 2018, operating costs have been reduced and the availability of the network has been sustainably increased. The Erzgebirge project is therefore considered to be more than a technical success; it is also an economic one. The location now serves as a reference for international railway companies for their own modernisation projects.

COMMENT

Digital transformation

Enno Wiebe, Director General Union des Industries Ferroviaires Européennes (UNIFE)

Photo: UNIFE

The railway industry is poised for a transformative digital revolution in the coming years, driven by advancements in technology and increasing demand for cost-efficient, sustainable transportation.

While digital interlockings are an example and representation of a modern, decentralised digital rail system - it's only just the beginning.

From the rail supply industry's perspective, rail's digitalisation offers significant opportunities to enhance infrastructure management, optimise operations, and improve safety through the integration of IoT, AI, and big data analytics.

Innovations such as predictive maintenance, real-time monitoring, and automated signalling systems will reduce downtime and operational costs, while digital twin technology is enabling virtual simulation and planning for infrastructure upgrades.

The rail supply industry is actively supporting the deployment and migration of crucial technologies such as ETCS, FRMCS, and the Digital Automatic Coupling.

Our future as a rail supply industry looks positive, with a yearly global growth of 3%.

However, we must continue to find new markets and opportunities.

As part of this, we will present our new digital World Rail Market Study at InnoTrans 2026 – a brand-new approach which is completely digital, and represents a fresh way to view inventory analysis and prospects of the railway supply industry.

There is still more to be done to digitalise European railways, and the European institutions will have to make their contribution and continue their support, as we strive for more harmonisation and dare to deploy boldly.

More than just a CV

The Eurailpress Career Boost digital showed how 90-second pitches can efficiently bring talent and companies together: young professionals from all over the world presented themselves live and made contacts with recruiters from the rail industry.

The second Eurailpress Career Boost digital took place on 17 September 2025. As at the premiere two years ago, Eurailpress editor-in-chief Georg Kern opened the event and guided the participating talents and company recruiters through the programme. Fourteen participants from the categories of railways, transport, urban mobility, sustainability, computing, engineering and construction each had 90 seconds to introduce themselves in digital livestream pitches. Recruiters from companies such as Spitzke SE, CAF, Stadler Rail and Quattron followed the presentations and were then able to arrange meetings via the InnoTransPlus platform. 'There's no pressure, everyone can talk to everyone,' emphasised Georg Kern right at the start. After the pitches, he facilitated personal exchanges and picked up on details from the CVs that had not been mentioned in the 90 seconds.

Personal contact in the age of AI

The presentations offered exciting insights: Ajay Vishnu Sridhar, a master's student in transport, engineering and mobility, already holds two patents in the textile sector. Lars Hilkens founded his own research team on magnetic levitation technology due to a lack of suitable opportunities. Transport planner Katja Jaschke described how chaotic rail replacement services motivated her to develop more user-friendly solutions. 'Naturally, pitches tend to focus heavily on educational qualifications. I think it is exciting to find out what kind of person is speaking,' said moderator Georg Kern.

The talents also appreciated the format: 'It's nice to be able to introduce yourself in person in an age when many people write their CVs with ChatGPT and recruiters use AI,' said Nils Heising, who had discovered his early passion for trains through the German children's TV show 'Sendung mit der Maus'. Recruiters such as Lucas Briesenick from Spitzke SE also emphasised the direct impression: 'We can specifically focus on the most interesting candidates.'

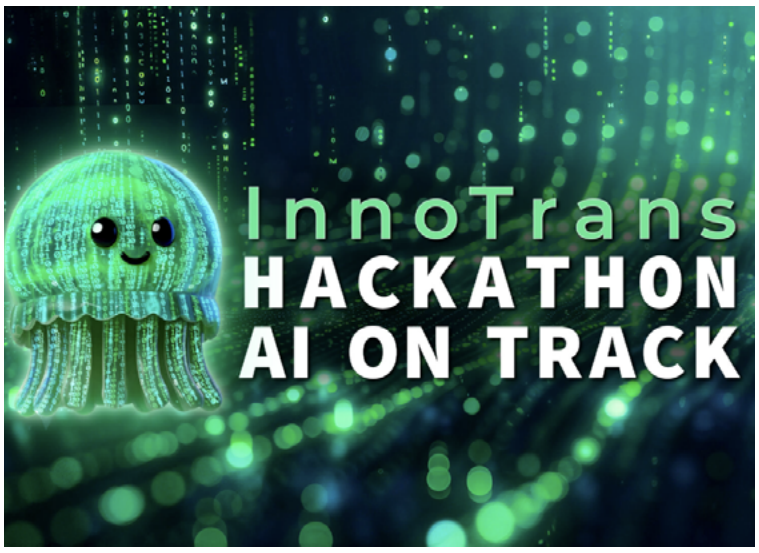
Fourteen international talents provided exciting insights into what motivates them to work in the rail industry. Photo: Messe Berlin GmbH

Wide variety of perspectives and opportunities

Wide variety of perspectives and opportunities

The participants' geographical backgrounds were as diverse as their motivations and educational histories, ranging from Latvia, the Netherlands and the UK to Switzerland, Romania and Hamburg. 'I was overwhelmed by the talent. It was exciting to learn how each of them views the industry in a different way – this helps to better understand different perspectives,' said Master's graduate Ali Zarroug, who has already gained railway experience in projects in Sudan, Malaysia and Australia. Ajay Vishnu Sridhar also praised the format: 'As a railway engineer, Career Boost has helped me a lot to make contacts. I would like to see it take place every year or even every six months.'

The next opportunity to kick-start careers will be at InnoTrans 2026 from 22 to 25 September 2026 in Berlin, where the Eurailpress Career Boost will once again take place live on stage at the InnoTrans Campus.



Real challenges facing the railway industry will meet bright minds at the InnoTrans 2026 Hackathon. Photo: MESSE BERLIN GMBH

InnoTrans Hackathon – AI on Track

Developers, start-ups and exhibitors develop smart solutions for the railways of tomorrow.

New ideas instead of old rail switches: the 'InnoTrans Hackathon – AI on Track' 2026 will bring fresh thinking to the world's leading trade fair for mobility. At the hackathon, creative developers will tackle specific challenges facing the rail industry. The aim is to use artificial intelligence to develop solutions that make operations more efficient, safer and more sustainable. The focus will be on real problems specified by sponsors. This creates a unique exchange: companies gain direct access to new ideas, unconventional solutions and external talent. At the same time, they visibly position themselves as drivers of progress and future technologies. For participants, the hackathon will offer the opportunity to present their concepts to an international audience of experts and to network with companies. The grand finale: the award ceremony, where the best teams and their visions will be honoured. More information at Hackathon

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INTERVIEW WITH ...

KAI MANGELBERGER, SENIOR VICE PRESIDENT MOBILITY AT MESSE BERLIN

Premiere of InnoTrans Asia

InnoTrans Asia will take place for the first time in 2027 – a new addition to the international trade fair calendar. It will be held every two years, in the year between the leading trade fair in Berlin. It will address the entire transport technology value chain: from transport companies, manufacturers and suppliers to administration, authorities and research and development. The trade fair is aimed at Asian players as well as international companies that are active in Asia or want to tap into markets there.

Kai Mangelberger has been in charge of the Mobility division at Messe Berlin since November 2024. Photo: Messe Berlin GmbH

InnoTrans Report:
What are the motivations behind organising the leading transport technology trade fair InnoTrans in Asia in the future?

Kai Mangelberger: Asia is a growth market where massive investments are being made in the expansion of railway infrastructure – both for passenger and freight transport – in China, India and Southeast Asia, for example. There is a continuously increasing demand for modern railway technology, automation and sustainable solutions. With InnoTrans Asia, we are creating a central platform for the Asian market – directly in the region, in Singapore.

Will the new trade fair in Singapore compete with the established InnoTrans in Berlin or do the two formats complement each other?

Kai Mangelberger: As we see it, InnoTrans Asia complements the world's leading trade fair in Berlin, the flagship and central meeting place for the global transport technology industry. The aim is to establish InnoTrans Asia as a link between emerging markets and global innovations. Unlike the mobility trade fairs in Asia, which are mostly nationally orientated, InnoTrans Asia is intended to cover the entire Asia-Pacific region and bring the various markets together at a neutral location.

How much advance planning and organisation was required for InnoTrans Asia and what challenges did you face?

Kai Mangelberger: The idea to set up InnoTrans Asia has been around for some time. Bearing in mind the very ambitious infrastructure projects currently underway throughout Asia, the timing is now perfect. It became more concrete at the beginning of this year when we held promising talks with Singapore. From then on, everything happened quite quickly. The launch in Singapore took place in June and at the same time we set up our InnoTrans Asia team at Messe Berlin Asia Pacific. The team is already working its hardest to make the premiere of InnoTrans Asia in September 2027 a success.

What do you personally expect for the future of the Asian mobility market and how can InnoTrans Asia contribute to networking and innovation here?

Kai Mangelberger: Whether it's the construction of a high-speed railway in Bangkok connecting three airports, the expansion of the metro network in Sydney, the cross-border high-speed rail link between Singapore and Malaysia or the planned high-speed line which will shorten the journey between Hanoi and Ho Chi Minh City from 30 to 6 hours – the mobility market in the Asia-Pacific region is undergoing enormous changes. I find that very exciting.
The experience and know-how of the world's leading trade fair for the sector provides InnoTrans Asia with a well-known, customised platform for companies to present themselves in Asia, establish contacts with potential customers and partners, and gain a comprehensive overview of global innovations in the transport sector. A supporting programme that is specially tailored to the Asian market also provides participants with valuable market insights.

How will InnoTrans Asia's exhibitor and visitor profile differ from that of the Berlin trade fair? Do you expect special focal points or new target groups?

Kai Mangelberger: InnoTrans Asia will clearly focus on exhibitors and visitors who are interested in the Asia-Pacific market. As a central, independent rail transport trade fair, it will offer an attractive platform to small and medium-sized companies in particular for making the leap into the otherwise highly fragmented Asian market with its numerous national trade fairs. There is no other Asian rail trade fair which gives the sector as much visibility as InnoTrans Asia.

Why did you decide in favour of Singapore as a location?

Kai Mangelberger: Singapore convinces with its central location in the Asia-Pacific region. The city is considered to be business-friendly, safe and innovative. In addition, it is established worldwide as a venue for trade fairs and congresses and offers the necessary infrastructure. The Singapore Expo site – in the immediate vicinity of the airport – is ideally located for InnoTrans Asia. Added to this is the neutrality of the location, which perfectly suits our concept. It makes it possible to bring the different railway nations together in one place without focussing too strongly on the host country. Furthermore, with Messe Berlin Asia Pacific we already have an experienced team on site.

Transport Leaders Panel at the launch of InnoTrans Asia in Singapore: experts discuss the future of sustainable, reliable and integrated urban mobility (from left): Moderator TC Chew, Managing Director Asia, Arup; in conversation with Yee Boon Cheow, Deputy Managing Director Infrastructure & Development, Land Transport Authority; Prodyut Dutt, Group Chief Operating Officer, Prasarana Malaysia; and Daniel Williams, Managing Director, Metro Trains Sydney. Photo: MESSE BERLIN GMBH

IN FOCUS

RAILWAY INFRASTRUCTURE

Digitalisation drives railway technologies forward

The railway industry is increasingly focusing on innovative solutions: from InspectRail's integrated diagnostic systems and RSRG's automated slab track procedures to AI-controlled air quality in Barcelona's metro network. This is complemented by SOGO's research into sub-ballast mats and ADIF's VR training for efficient maintenance.

AI improves air quality in Barcelona's metro

Artificial intelligence for ventilation in the Barcelona underground railway system

Photo: Sener

Underground railways are complex ecosystems with tunnels and carriages full of passengers, as well as an invisible world of particles, gases and microorganisms. Trains come and go, doors open and close, passengers rush to their daily routines. But what about the air being breathed in this underground labyrinth? Sener's Respira® intelligent ventilation system monitors and optimises the climate in metro systems.

One of the key elements in ensuring adequate air quality is ventilation. Unlike conventional buildings, where HVAC systems regulate temperature and air quality, the underground railway relies on mechanical ventilation to renew the air below ground. This prevents excessive concentrations of contamination which may affect human health, while maintaining appropriate temperature and humidity conditions for passengers and employees.

Ventilation in underground infrastructures such as metros is a complex science. The interaction of numerous factors – from outside air quality and wear and tear of trains to weather conditions – creates a dynamic environment. In this context, data analysis and the use of AI are considered essential tools for an optimised control of the infrastructure in terms of air quality, thermal comfort and energy efficiency

Intelligent ventilation control

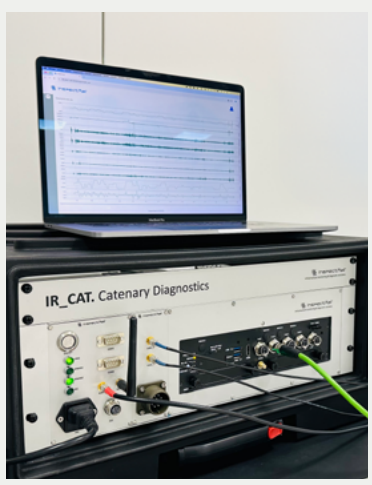
Sener's Respira® intelligent ventilation control system is capable of monitoring and optimising temperature, air quality and energy efficiency in underground stations and tunnels. Based on dynamic algorithms, it seeks to balance complex variables such as temperature, air quality, comfort and energy consumption of the systems. This improves the air quality while at the same time reducing energy consumption. Respira® controls the entire conventional underground railway network in Barcelona, which consists of more than 130 stations and over 170 kilometres of track. The system controls a total of 324 axial fans throughout the network. During the summer months, this resulted in a temperature reduction of more than 1.3 °C in the stations and annual savings of 7.2 GWh or the equivalent to 1.7 million euros. During this period, air quality conditions were continuously monitored and ventilation was controlled to ensure that the values specified by World Health Organisation regulations and recommendations were complied with at all times.

Digital infrastructure monitoring made easy

InspectRail's integrated approach to data-driven diagnostics enables operators – including regional and urban networks – to access advanced monitoring capabilities which were previously only available for large-scale systems.

As digitalisation is transforming the rail industry, infrastructure managers are under pressure to modernise maintenance strategies while keeping costs under control. Despite this, advanced monitoring systems often remain out of reach for many networks due to their complexity and price.

InspectRail has developed a fully integrated 360° monitoring solution tailored to the needs of infrastructure managers and owners operating with different degrees of digitalisation. By combining robust on-board sensor technology with cloud-based analysis, the Spanish technology start-up offers a scalable, plug-and-play approach to monitoring tracks, overhead lines and communication systems.



InspectRail hardware is modular and scalable

Photo: InspectRail

One of the key elements is IR_COM, an on-board or portable system which measures and maps the performance of wireless communication networks under real operating conditions. IR_COM is designed to support LTE/5G, TETRA and other rail-specific technologies. It records both RF and QoS parameters such as latency and jitter. All recorded data is geo-referenced and uploaded to a cloud platform. This allows users to access interactive dashboards which enable network diagnostics, coverage validation and performance comparisons.

Infrastructure monitoring in laboratory quality

With a view to the upcoming FRMCS migration, IR_COM also serves as a central tool for assessing the operational readiness of existing networks, identifying radio coverage gaps and supporting the planning of new implementations.

"Our goal is to enable operators – whether public or private, large or small – to monitor and validate the performance of critical networks with minimal effort and maximum transparency," says Unai Alvarado, CTO and co-founder of InspectRail. "We offer flexibility – ranging from full ownership via on-demand inspections to continuous monitoring as a service."

IR_COM is already in commercial use and exemplifies InspectRail's broader strategy of providing modular, field-proven tools which make digital maintenance smarter, faster and more accessible.

By converting any vehicle into a mobile diagnosis platform, InspectRail opens up new possibilities which were previously only available on board specialised measurement trains.

Rigid track efficiency

RhoMAT combines several work steps and simultaneously increases the accuracy of the end product

Support for the construction of slab tracks

Photos: Rhomberg Sersa Rail Group

Rigid track systems in railway construction are crucial for both low-maintenance operation and high track availability. However, manufacturing these systems is often laborious and there is a lack of efficient construction methods. This is where the Rhomberg Sersa Rail Group (RSRG) comes in with its solutions.

Based on many years of experience in the construction and maintenance of a wide variety of different superstructure solutions, RSRG is developing new approaches to sustainably increase the efficiency of these systems. One example of this is the tachymeter-controlled automatic track lifting and alignment device RhoMAT, which combines several work steps and simultaneously increases the accuracy of the end product.

The RhoMAT's 14-metre-long longitudinal frame roughly positions the track grid in terms of position and height while reducing tensions in the rails and significantly accelerating the tachymeter-controlled alignment process.

The prototype has been developed in collaboration with partners and was successfully tested in the German 'ARGE S21 Feste Fahrbahn Fildern' project. The combination of lifting and aligning led to a noticeable reduction in the length of the work site and a 15 percent increase in installation performance. Thanks to the integrated quality control, the system ensures efficient and safe operation. The necessary work force is reduced by 50 percent, and physically demanding work is largely eliminated. Depending on the track system, the mobile and modularly adaptable system enables daily outputs of up to 300 metres. For less demanding applications, the RhoMAT can even handle the entire fine alignment process, thus contributing significantly to increased quality, efficiency and occupational safety in track construction. The Rhomberg Sersa Rail Group offers its customers further efficiency-enhancing solutions for the continuous optimisation of railway infrastructure, including robot-based marketing systems, real-time quality assurance measurements and camera-based monitoring of construction progress.

Virtual training for maintenance work

Training with the railway infrastructure simulator at ADIF

Photo: Virtualware

Administrador de Infraestructuras Ferroviarias (ADIF) and Virtualware have developed a modular virtual reality platform for technical and operational training in the field of railway infrastructure.

ADIF, the public entity responsible for managing Spain's national railway network, has implemented a virtual reality (VR) based simulator in collaboration with Virtualware to support training in infrastructure operation and maintenance. Based on Virtualware's VIROO® platform, the system covers the entire training cycle: from content creation to the delivery of training sessions and performance assessment.

The simulator features a library of railway infrastructure assets and a synthetic 3D environment controlled by real operating rules. Instructors use author's tools to create exercises which combine VR learning units and multimedia content. Training sessions can be conducted on desktop PCs, with headsets, in immersive cubes (CAVEs) or in large-scale arenas, enabling multi-user operation and remote participation.

The system allows for personalised training by assigning tasks individually and monitoring learners' progress in real time. Thanks to its modular architecture, it can be adapted to different railway authorities and operators.

In January 2024, over 30 instructors were taught how to independently develop content.

The simulator is currently in use at ADIF's Technological Training Centre in Valencia and was also presented at the UIC World Congress on Rail Training 2025 in Chengdu. It has proven to be extremely effective in teaching, among other things through higher learner participation, improved knowledge retention and more efficient practical training.

NEWS

SOGO is carrying out research on a European under-ballast mat

Under-ballast mats (UBM) in ballast-bound track structures serve to reduce vibrations and noise and to protect the ballast layer from rapid erosion. SOGO has conducted a series of experimental tests in accordance with European standard EN 17282 to develop a comprehensive product range of under-ballast mats for use in ballast-bound track structures.

Various values were determined for the static subgrade modulus (Cstat), the dynamic subgrade modulus at low frequencies (Cdyn at 5, 10 and 20 Hz) as well as for the subgrade modulus at higher frequencies.

During the R&D phase, closed-cell neoprene (expanded rubber) and closed-cell ethylene propylene diene monomer (EPDM – also expanded rubber) with thicknesses of 10 to 25 mm and densities of 150 to 700 kg/m3 were defined as suitable materials.

In parallel, a semi-analytical tool – a numerical analysis with static or moving loads – was used to investigate the static and dynamic vertical rail deformations for different speeds and axle loads, as well as the effectiveness of the vibration isolation (insertion damping). A field trial will be conducted on an urban track section equipped with an expanded EPDM rubber sub-ballast mat by the end of 2025. SOGO has also recently developed and delivered a ballast mat made of recycled rubber bound with a polyurethane binder (density 600 kg/m3, thickness 20 mm) for high-speed lines. Building on these R&D results, future activities will aim to develop anti-vibration mats made from recycled rubber in different densities and thicknesses.

Photo: SOGO S.p.A.

Sub-ballast mat made from recycled rubber

Alstom Traxx hybrid locomotive passing over a bridge in Oslo
Photo: ALSTOM SA. YAN-tv | Traxx™

Norway's railway system upgrade

Around the world, the transport sector generates over a third of energy-related carbon dioxide emissions. There is a pressing need for sustainable solutions. Norway, known for its impressive fjords and strong commitment to the environment, is making great strides in this area and is modernising the country's entire rail network. Alstom is playing a key role in integrating intelligent onboard systems.

The Norwegian railway project impressively demonstrates the multifaceted approach to reducing emissions in the transport sector. The initiative aims to improve connectivity and promote trains as an environmentally friendly alternative in the transport system. Over 4,200 kilometres of track are being modernised and more than 400 trains are being equipped with state-of-the-art train control technology. The success of this project is based on a cooperation between various players – including Alstom – and its central role in integrating intelligent on-board systems which connect the rail network.

At the heart of this development is the European Rail Traffic Management System (ERTMS). Originally developed to harmonise the different European signalling systems, ERTMS has now established itself as the global benchmark for train safety and efficiency. Its integration into Norway's diverse train fleet highlights the complexity of equipping each train with specific onboard systems. This requires precise engineering and comprehensive planning. As a prerequisite for the effective visualisation of technical challenges, Alstom uses advanced 3D modelling tools and integrated workflows to create cloud-based digital twins of trains and rail networks.

Decarbonising rail transport

Alstom's Onvia™ signalling system brings further improvements, using advanced digital technology to increase safety, efficiency and interoperability on the rail network. This initiative is more than a technological upgrade – it represents a fundamental change in operational philosophy. "ERTMS increases capacity on existing railway lines. It is a fundamentally different approach – a continuous communication system which reduces the safe distance between trains, thereby increasing both capacity and reliability," emphasises Jean-Philippe Garbit, Managing Director Digital & Integrated Systems Nordics at Alstom.

Modernisation of the Norwegian rail system is an exemplary model for the global need to decarbonise transport. With its focus on digital technologies, long-term strategies and partnership-based cooperation, Norway is demonstrating the potential of rail transport as a sustainable transport solution. While other nations are seeking to reduce their CO_2 emissions, Norway's path to a digitally connected and environmentally conscious rail network provides a valuable blueprint for the future.

NEWS

Know what's happening on the tracks

Under the slogan 'Condition Monitoring for Predictive Maintenance', WAGO, a specialist in automation and connector technology, offers a remote monitoring solution which can be used in rail networks worldwide: the WAGO Monitoring Health System. With this solution, rail and signal box operators can remotely monitor the condition and functionality of their components on the track, receive error messages and remotely control their systems if necessary.

One example is turnout heating, which is regularly activated even during the summer months. If it draws power it is considered functional – and is therefore ready for use in winter. The advantage: in the event of a malfunction, technicians do not necessarily have to rush to track sections, many of which are very remote. Maintenance cycles and spare parts orders – often associated with long delivery times – become more predictable.

A central component of the solution is the WAGO I/O System 750 XTR – for new and existing lines alike. The standard industrial component with hardened software has been specially adapted for the railway market. This system works reliably under extreme conditions: from -40 to +70 °C. It is vibration-, shake- and shock-resistant. The CODESYS V3 engineering environment ensures configuration, programming, diagnostics and visualisation. If desired, robust M12 connections can replace the RJ-45 connectors which are still commonly used. M12 connections are the more reliable option for the heavy and rigid ETHERNET cabling material used in rail transport. They are protected against dirt and moisture, and thus ensure reliable contact and error-free data transmission. The system is supplemented by various connection technologies which are maintenance-free thanks to spring clamp technology and allow the connection and release of conductors without tools by using a lever, which is an advantage for technicians in the field.

The WAGO I/O System 750 XTR is a central component of the condition monitoring solution. Photo: PMF WAGO

Optimisation of railway workshops

Machine distribution, workflows, safety and budget management are factors which can significantly influence the efficiency and effectiveness of maintenance processes. To avoid delays and additional costs, ACYGS focuses on optimising the design and operation of workshops.

Integration of advanced technologies Photo: Luca Bigolin, ACYGS Graphics Department

The starting point for this approach is the rolling stock maintenance plan, which describes the activities to be carried out and the equipment required. This is the basis for developing a detailed workshop plan which determines the appropriate size of the work areas, defines specific stations for each task and optimises the flow of components within each zone. This planning ensures that from the early stages the project is designed with all the necessary elements to avoid potential problems during implementation and operation.

An outstanding feature of this new methodology is the integration of advanced technologies such as automation, Industry 4.0, artificial intelligence (AI) and building information modelling (BIM). These tools improve planning accuracy and also enable continuous monitoring and optimisation of maintenance processes.

Metamorphosis of maintenance management

Repetitive tasks can, for example, be carried out more easily when they are automated, reducing human errors and increasing safety and efficiency. Industry 4.0 uses sensors and networked systems to collect and analyse real-time data, which provides a basis for well-founded decisions and the early detection of potential failures. AI can be used to analyse large amounts of historical and current data to optimise maintenance cycles, allocate resources more efficiently and predict potential failures at an early stage. Finally, the use of BIM allows the workshop design to be simulated and visualised in detail before construction begins, ensuring that all elements are correctly distributed and meet operational requirements.

The implementation of these technologies in railway workshops transforms maintenance management and increases the efficiency and effectiveness of operations. ACYGS integrates these advanced methodologies into its projects, ensuring optimised processes from design to execution.

1500W solid-state laser Photo: Oliva Torras Railway

Laser welding for railway interior fittings

Thanks to its precision and efficiency, laser technology is used for cutting, welding and marking – and increasingly in additive manufacturing, for example through selective sintering and melting of metals. At Oliva Torras, laser technology is used specifically for welding components.

The term 'laser' stands for 'light amplification by stimulated emission of radiation' and describes a technology with three key advantages. Firstly, the laser generates synchronised light waves which focus the beam in a targeted manner. Secondly, the light travels in a straight line without scattering. Thirdly, the high intensity allows large amounts of energy to be focused with pinpoint accuracy.

The first CO_2 lasers using infrared light were used for welding as early as in the 1970s. Over time, Nd:YAG (solid-state lasers with yttrium aluminium garnet crystal and doped neodymium) as well as fibre lasers were developed, which allow even greater precision and control – especially in demanding industries such as the automotive and aerospace industries.

Higher welding speeds minimise deformation

Oliva Torras Railway uses this advanced technology for welding railway interior fittings, such as control panels, window frames, door pillars, side walls and end walls. The company is certified in accordance with the railway sector quality requirements , ISO 13919-1 for welding steel and ISO 13919-2 for welding aluminium.

A 1500-watt solid-state laser is used for manual laser welding, which can be used with filler material or without. The process is particularly suitable for thin sheets with a thickness of 0.8 to 4.0 mm and long weld seams. Compared to conventional metal welding processes, laser welding offers significantly higher speeds. While metal welding with active gases (MAG) achieves speeds of around 5 mm/s and tungsten inert gas welding (TIG) achieves 1 to 2 mm/s, the laser can achieve up to 10 mm/s. The higher speed reduces thermal stress and thus minimises deformation.

Laser welding is therefore ideal for aesthetic components without structural requirements, for polished welded assemblies, for parts with demanding visible seams and for watertight but non-pressure-bearing components. The technology is suitable for steel, aluminium and stainless steel parts and enables particularly high-quality, polishable welded joints, especially on galvanised sheet metal – better than with conventional welding processes.

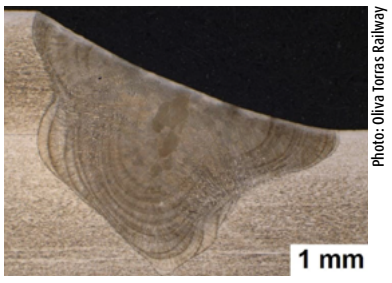


Photo: Oliva Torras Railway

Metallographic cross section

Sustainable project for Cologne's S-Bahn rail system

The Dutch family-owned company BMS Project Upholstery has implemented circular economy principles in the rail industry as part of its project for Cologne's S-Bahn rail system. It based its approach on the '6 Rs': refurbishment, repair, redesign, reuse, reduce and recycle.

In the 'Cologne S-Bahn' project, BMS modernised existing seats, repaired damaged frame components and redesigned the seats in collaboration with Deutsche Bahn and the Munich-based design studio neomind. Old seat and metal components were reconditioned for immediate or later use. By reusing components, BMS was able to significantly reduce the waste normally generated when purchasing new seats. For this purpose, materials such as metal shells, foam, fire retardants, fabric covers and e-leather (Gen Phoenix) were recycled.

Recycling methods

The BMS recycling process is as follows: at the end of its life cycle, foam is shredded for reuse, fire retardants and fabric covers are ground and can then be used to manufacture new fabrics. E-leather, which is made from leather scraps, has a high recycling potential. Adhesives are separated using thermal processes. To minimise the consumption of adhesives, BMS uses Velcro fasteners, which also facilitate the future reuse of components.

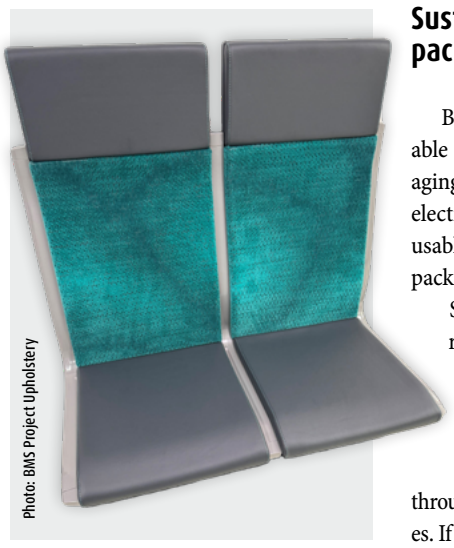


Photo: BMS Project Upholstery

Seats on the Cologne S-Bahn

Sustainable transport and packaging

BMS also pays attention to sustainable transport and appropriate packaging. The company uses Euro 6 and electric vehicles for transport and reusable cardboard boxes to avoid plastic packaging.

Sustainability, CO2 neutrality and the reduction of its ecological footprint have been part of BMS's corporate identity since it was founded in 1968. The company focuses on extending the service life of seats through maintenance and repair services. If a seat can no longer be repaired, the components are redesigned and further developed for reuse. BMS also supports customers in renovating entire fleets and takes responsibility for the materials used by ensuring that all components are recycled at the end of a seat's life cycle.

If circular processes become standard, they will contribute to a more sustainable future for the railway industry.

NEWS

More efficient and cost-effective train operations

nROK 6231 from NEXCOM International in Taiwan is an industrial computer which has been specially developed for use in trains. It is extremely robust and reliable, meets high safety standards and does not require a fan, making it very durable. The device ensures quick and easy communication between the train and the control centre. Thanks to a wide range of interfaces, the computer can be connected to the train network, WLAN and mobile data networks. Up to eight SIM cards can be used, ensuring a good internet connection or particularly fast internet at all times.
Thanks to its intelligent control system, the computer can be started remotely – for example, by turning the train key, at a defined time or via SMS. The nROK 6231 offers numerous connection options for screens and other accessories, meaning it can also be used for passenger information, train operation control or video surveillance. The system can be expanded as required with additional cards, for example for passenger counting.

Special version for applications in rail vehicles Photo: NEXCOM

Energy efficiency for tunnel ventilation

Ventilation is one of the key systems for ensuring safety and comfort in metro, railway and road tunnels. It ensures pleasant ambient conditions and safely removes smoke in the event of a fire but also incurs high energy costs. Thanks to their high efficiency, these costs can be reduced using axial fans from ZITRÓN.

Ventilation systems on metro lines, for example, operate practically around the clock and cause correspondingly high annual energy costs. A study carried out by Transports Metropolitans de Barcelona (TMB) which analysed the energy consumption of individual systems clearly shows that ventilation is the most energy-intensive system which is not related to traction. As a first step towards reducing energy consumption, TMB decided to improve ventilation management. This starts with the introduction of innovation programmes which regularly collect measurement data (such as temperatures, smoke and gas concentrations, external weather conditions, etc.) to adjust flow rates and optimise energy use. According to EU regulations, European Directive (EU) 2019/1781 must be implemented. This stipulates that electric motors must achieve at least IE3 or IE4 efficiency, depending on the power class. This improves motor efficiency by around 1.5 to 2.0 per cent.

High-performance fan Photo: ZITRÓN

However, there are other aspects which are not covered by the aforementioned directive, but have a far greater influence on energy-saving potential. These relate directly to the fan unit. ZITRÓN now uses the latest generation of axial fans in most of its metro projects. While conventional fans achieve an efficiency rate of around 65 per cent, these fans achieve efficiencies of around 75 per cent thanks to their highly developed design (e.g. special guide rails, encapsulated motors and special symmetry).
Although the initial investment for such a highly efficient fan is 25 to 40 percent higher, its annual energy consumption is around ten percent lower than that of a conventional unit and its average service life is around 15 years. Additional investment in high-quality equipment therefore results in considerable energy savings in the long term. There is considerable further potential to increase efficiency through energy management of ventilation systems, which in some installations are associated with very high energy consumption.

Mobility Cleaning Circle: Clean travel

How hygiene, innovation and strong partnerships are able to make public transport more attractive - a review of the fourth Mobility Cleaning Circle.

Cleanliness in public transport is more than just an aesthetic detail - it also determines whether people like to use buses and trains. This was the focus of the fourth Mobility Cleaning Circle (MCC), organised by CMS together with InnoTrans at CMS Berlin on 24 September 2025. The dialogue platform brought together 88 participants from transport companies and the cleaning industry. The aim was to network, discuss requirements and solutions and have live experiences of innovative products in the field of transport cleaning. After the welcome address, networking at the buffet and bar tables provided the ideal setting for dialogue between representatives of the rail and cleaning industries. The focus was on discussions on practical issues. Gero Schotte from DB Systemtechnik reported on the complex testing procedures for new cleaning agents, while Edvin Kosaric, Project Manager at Stuttgarter Straßenbahnen, emphasised the value of current industry insights. Isabella Caliva and Lisa Versemann from Metronom Eisenbahngesellschaft also took away valuable ideas, for example on the sustainable handling of train paints. For manufacturers of cleaning agents such as Dr Schnell, a long-standing partner of transport companies, getting to know each other personally was just as important as presenting own solutions - for example during the live demonstration of graffiti removal. The programme was complemented by insights into digital applications such as the Fresh Fleet app, which uses AI to control cleaning cycles, as well as presentations of cleaning machines by exhibitors Tennant and Numatic. MCC 2025 has demonstrated how important it is for the transport and cleaning industries to engage in dialogue and partnerships. The successful format will be continued, with the networking event taking place again at InnoTrans in 2026.

Exhibition grounds InnoTrans 2026

- Railway Technology
- Interiors incl. Travel Catering & Comfort Services
- Railway Infrastructure
- Tunnel Construction
- Public Transport incl. Mobility+ AI Mobility Lab
- Outdoor Display *Gleis- und Freigelände*
- Bus Display
- InnoTrans Campus
- Opening Ceremony *Eröffnungsveranstaltung*
- InnoTrans Convention
- Speakers' Corner
- Business Lounge (Marshall-Haus)
- Press Center *Pressezentrum*
- FoodCourt
- Jelbi hub shared mobility Pickup & Drop-off for rental two-wheeled vehicles *Mobilitätsflächen für Miet-Zweiräder*

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