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InnoTrans 2022 Report

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First surveys for railway tunnels on the new Dresden-Prague line

Taking samples of soil for planning of the new Dresden-Prague railway line.

Photo: DB AG/Natalie Klein

Germany's longest railway tunnel is to be built across the Ore Mountains to better connect the metropolises of Dresden and Prague. In order to find the ideal tunnel alignment, Deutsche Bahn AG (DB) is now conducting its second drilling campaign.

■ Initial results for possible tunnel routings have already been deduced from earth drillings in the Ore Mountains. DB project manager Kay Müller emphasised the importance of progress in the project for the ecological transport turnaround. In future, there should be much faster and more frequent passenger and freight trains between Dresden and Prague. They would then link the metropolises in just an hour, and it should become possible to relieve the much frequented Elbe valley.

The first exploratory drillings evaluated

Before the tunnel itself can be planned, geological test-drilling has to be carried out in the Ore Mountains. DB has been carrying out such measurements and drilling since 2020. The first boreholes to examine the geological formations reached down to a depth of 400 metres below ground. In total, around 130 boreholes were examined at nine points. In the Central Saxon Mountains, the soil and rock samples taken are of good rock quality. Only very few adverse factors were found, and on the basis of these findings it is expected that the tunnel could be built without any major difficulties. In the Gottleuba valley, on the other hand, several fractures and irregularities in the rock structure were found, and these will have to be taken into account for tunnel alignment planning. The structure in the Börnersdorf area was also examined in detail; however, it is not yet possible to determine an alignment from the current findings. In the second drilling campaign, from November 2021 to May 2023, 14 up to 500 metre deep boreholes are expected to be drilled.

Planning status

The Dresden-Prague upgrading project is currently in the early planning phase. DB has worked out several possible variants for the future layout of the additional and adapted tracks in Heidenau. The options to build part of the section in a tunnel with the other part above ground as well as a continuous tunnel are being investigated. The aim is to identify a so-called preferred variant. "This must be compatible with the entire region and the environment and also take into account economic and regulatory approval aspects. In addition, the solution must comply with the specifications and criteria of the German Federal Government," said a railway spokesperson. "The decision for the preferred variant will only be made at the end of the preliminary planning process, probably in 2024."

New Dresden-Prague line

The rail link between Dresden and Prague is part of the trans-European Orient / East-Mediterranean corridor. It connects the German North and Baltic Sea ports with the economic centres in south-eastern Europe and passes through nine member states of the European Union. The route is of strategic importance for freight transport. The necessary cross-border tunnel through the Ore Mountains will be at least 25 kilometres long, 15 kilometres of which will be on the German side, making it the longest railway tunnel in Germany.

DB ⚑ City Cube Berlin | 410

Drill core of a sample from Gersdorf (Bahretal).

Photo: DB AG/Natalie Klein

COMMENT ■

More trains to move Europe

Prof. Dr.-Ing. Roland Leucker, Managing director of STUVA e. V.

Photo: STUVA

Travelling by train from Dresden to Prague through the beautiful Elbe valley is something for romantic railway enthusiasts. The only electrified line between Germany and the Czech Republic meanders leisurely through the Ore Mountains. Two and a half hours are needed for the 250 kilometres long line – yet the two cities are only 120 kilometres apart. Currently, the closer national rail networks in Europe come to their country's borders, the more sparse they become. Any cross-border lines which exist are not electrified, so in most cases they can only be operated using diesel locomotives. The upgrading with international high speed lines as decided and promoted by the European Union (EU) as early as 1990 is only progressing slowly. In some cases, fast direct train connections fail as a consequence of differing national signalling systems. In other cases, the shortage of professionals and therefore of train drivers is further complicated by the lack of knowledge of foreign languages. Language proficiency level B1 is requested to operate in a neighbouring country, and the fear of foreign competition might be a further obstacle. A mere 125 trains cross intra-European borders each day. With the "Green Deal", however, the EU moved things to the next level two years ago by increasing funding for the upgrading of the nine core network corridors of the Trans-European Transport Network. Since then, things have started to move for the planned Ore Mountains tunnel. DB Netz AG and its Czech partner Správa železnic are now pushing ahead at high speed to build the tunnel which will be at least 25 kilometres long. It is the core element of the new line from Dresden to Prague and thus the key structure of the core network corridor "Orient-East-Mediterranean" which is due to enable direct high-speed connections for freight and passengers from the North and Baltic Seas to Athens and Istanbul. It will then be possible to cover the distance from Dresden to Prague in one hour. The hope for a performing railway future in Europe is thus still alive. It is high time for climate protection.

STUVA ⚑ Hall 5.2 | 940

InnoTrans Convention: Learn today what will drive us tomorrow

High-profile supporting programme with leading decision-makers

Dialogue forums are held on different aspects of rail transport. Photo: Messe Berlin GmbH

Representatives of the associations, such as Philippe Citroën from UNIFE, take part in the International Press Circle. Photo: Messe Berlin GmbH

At InnoTrans, top-class panel discussions, expert forums and the International Press Circle will shed light on all facets of mobility. This is where decision-makers from business, politics and transport exchange ideas and experiences at an international level.

On 19 September, representatives of German and international media and associations will kick off the trade fair with the **International Press Circle**. Following a one-hour networking brunch they will be taken on the **World Innovation Press Tour**, an exclusive circuit along the world premieres and new developments.

InnoTrans Convention from automation to networking

The main focus will be on the daily **Dialogue Forums** from 21 to 23 September, held under the auspices of the German Railway Industry Association (VDB), the German Transport Forum (DVF), the Association of the European Rail Industry (UNIFE) and the German Electrical and Electronic Manufacturers' Association (ZVEI). Topics include, for example, the automation of rail transport (DVF) and 5G in mobility (ZVEI). At the **Rail Leaders' Summit** (RLS) on 20 September at the Palais am Funkturm, transport ministers and general managers of international transport companies will discuss the pioneering role of rail transport. The Summit is being organised by Deutsche Bahn AG, the German Federal Ministry for Digital and Transport (BMDV) and Messe Berlin GmbH. More than 400 participants attended the last RLS.

On 21 September, the **International Design Forum** will focus on the aspect of design in public transport, from passenger experience to networked vehicles. The International Design Centre Berlin (IDZ) is in charge of the content of the event. The Tunnel Construction segment of the fair will be represented on 21 and 22 September as part of the **International Tunnel Forum** and will offer various internationally attended and compact discussion forums. The organiser is STUVA e.V. (Research Association for Tunnels and Transportation Facilities). One of the discussion panels, for example, will deal with the renewal of tunnels under operation.

In the Bus Display in the Summer Garden, trade visitors can experience moving buses. Organised by the German Transport Forum (Deutsches Verkehrsforum), the International Bus Forum will take place on 22 September. The German Transport Forum (DVF) as its organiser has chosen the topic "Mobility as a citizen service – sustainable, smart and available everywhere".

Further forums are the **Innovation Forum** of Deutsche Bahn AG and the **Public Transport Forum**. The latter is all about developments in local public transport. The forum will be organised by ETC Transport Consultants GmbH.

Dr. Richard Lutz, Deutsche Bahn AG Chairman of the Board, at the Rail Leaders' Summit. Photo: Messe Berlin GmbH

More info at **InnoTrans Convention.**

Don't miss anything:
The live streams will also be available on the **InnoTrans website** and on **InnoTransPlus** after the events.

On 23 September, the first **Hyperloop Conference** will take place in the framework of the Conference Corner with a variety of formats around the ultra-high-speed transport of tomorrow.

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Bane NOR wins European Railway Award 2022 for ERTMS implementation

Sverre Kjenne, COO at Bane NOR SF with the "Rail Trailblazer Award 2022". Photo: Bernal Revert/BR&U

Norwegian state railway infrastructure operator Bane NOR SF has been given the "European Railway Award 2022" for its pioneering role in the implementation of the European train control and management system ERTMS.

At an online event on 8 February 2022, Sverre Kjenne, Executive Vice President of Operations and Technology at Bane NOR, received the award from both the Community of European Railway and Infrastructure Companies (CER) and the European Rail Industry Association (UNIFE). By 2034, Bane NOR intends to have digitised more than 4,200 kilometres of track and equipped about 350 stations and 400 vehicles with ERTMS/ETCS Level 2. The control centres will be modernised and equipped with the new traffic management system TMS. To this end, Bane NOR will invest about 25 billion Norwegian kroner (about 2.5 billion euros). In 2012, the decision was made in favour of the European system, and in 2018 contracts were signed with the manufacturers Alstom, Siemens and Thales. The project is one of Norway's largest digitisation projects.

Few interfaces – early changeover

"On 31 October 2022 at 2.30 pm, the first ERTMS-equipped line will be opened to traffic," Sverre Kjenne said at the event. It will then be possible to abandon the signalling equipment along the line. The great advantages of ERTMS are more safety and timeliness, while freight transportation by rail will become more competitive. However, freight railway undertakings will have a particularly hard time due to the costs of retrofitting their fleets. He said that in Norway, the state pays half of their retrofitting costs. He was still learning himself with the introduction of ERTMS, said Kjenne, but then he gave some tips to railway companies and infrastructure managers in the European Union. The number of technical interfaces should be kept as low as possible and vehicles should be converted as early as possible. An important factor, he said, is to well equip the IT departments in the company. "And then, you set a date for the opening of the line and don't get carried away," he advised. He added that one should not be tempted to expand the scope of the project more and more as time passes by.

A donation to Engineers Without Borders

The award comes with prize money which is donated to a charity of the winner's choice. Bane NOR has donated the money to Engineers Without Borders, a non-profit organisation which contributes to aid for developing countries through technical expertise and the use of technology. **UNIFE Hall 27 | 660**

NEWS

New CEO at Škoda

Didier Pfleger Photo: Škoda Transportation Group

Didier Pfleger (57) became the new CEO of Škoda Group and the chairman of the board of Škoda Transportation a.s. on 14 February 2022. Pfleger previously worked at Alstom, where he served for more than a decade, in positions such as member of the board of directors or head of the electric bus division Aptis. Pfleger is planning to drive Škoda's transformation to become a diversified manufacturer of modern transport systems and solutions and to bring forward the company's geographic expansion. The new CEO succeeds Petr Brzezina, who led Škoda from 2018.

SKODA Hall 3.2 | 660 and Outdoor Display

Call for project submissions

Europe's Rail, the successor organisation to Shift2Rail, has launched its first call for research and development projects. The European Union is funding this round with 243 million euros. Eligible projects are Network management planning and control & Mobility Management in a multimodal environment and Digital Enablers, (2) Digital & Automated up to Autonomous Train Operations, (3) Intelligent & Integrated asset manageent, (4) A sustainable and green rail system, (5) Sustainable Competitive Digital Green Rail Freight Services, and (6) Regional rail services / Innovative rail services to revitalise capillary lines. Applications can be submitted until 23 June 2022. More information is available here.

EUROPE'S RAIL Hall 27 | 511

Deutsche Bahn honoured as best employer for women

A 30 per cent share of women in management by 2024 - Deutsche Bahn AG awarded. Photo: DB AG/Max Lautenschläger

On 8 March 2022, the "Women in Transport – EU Platform" of the European Commission and the Community of European Railway and Infrastructure Companies (CER) presented the "Women in Rail Award" for the first time. Deutsche Bahn AG was awarded "Best Employer" for women for its strategy to increase the proportion of women in management to 30 percent by 2024. The strategy targets the areas of personnel marketing, recruiting and monitoring. The prize in the category "Inclusion" was won by the Société nationale des chemins de fer français (SNCF). Ferrocarrils de la Generalitat de Catalunya (FGC) was awarded for the best initiative against sexual harassment. The jury named Linda Allen, Head of Talent Management at Irish Rail, as the industry's "Rising Star". She founded the Talent Management Centre and launched initiatives such as leadership training for women, a women's network at Irish Rail and a mentoring programme.

DB City Cube Berlin | 410

Integrated solutions for mobility

The Icomera X5 router delivers over 1 gigabit of data per second to a moving train. Photo: Icomera AB

As a systems integration specialist, EQUANS SAS addresses all the complex components of a network and their interaction, offering turnkey solutions for infrastructures and digital services. In the transport sector, the French group relies on the know-how of its subsidiaries to provide a wide range of public transport services.

In the infrastructure sector, EQUANS' range of services includes electrification, power supply, safety and signalling systems, based on the know-how of its subsidiaries Powerlines Group, Ineo and SCLE SFE. The Powerlines Group is one of the leading European suppliers in the field of electrification of mass transit, regional and mainline infrastructures - trams, metros, light rail and trolleybuses in urban transport, standard lines and high-speed lines in long-distance transport. Being a systems supplier for railway electrification, the group's services range from consulting and engineering to installation and maintenance as well as product development and sales. The product portfolio includes components and complete systems, such as contact wire clamps or masts made of glass-fibre reinforced plastic (GRP).

Monitoring and safety of operations

With SOCRAT, Ineo has developed and patented a reliable system to remotely monitor overhead contact line systems. SOCRAT measures the displacement of the contact wire and of the tensioning weights as well as, in parallel, the temperatures of the contact wire and the ambient air. This allows the operational status of the overhead contact line to be determined, malfunctions to be detected and maintenance personnel to be alerted in real time.

SCLE SFE has developed a generic safety platform which is certified to the highest safety requirement level, Safety Integrity Level 4 (SIL4), according to the European standards for digital railway signalling applications: the Base Générique de Sécurité, BGS. On the basis of this general platform, EQUANS' operational safety experts will develop specific systems or equipment and will programme the associated application software, including crosswind detectors and decentralised interlockings.

Onboard connectivity

As a leading provider of onboard connectivity solutions in public transport, Icomera supports a wide range of digital applications which enhance passenger satisfaction and improve safety and operational efficiency. In 2003, Icomera developed and implemented one of the world's first on-board Wi-Fi services in cooperation with the Swedish railway undertaking SJ. Icomera now claims to deliver the fastest and most reliable internet connection available in a moving vehicle. In 2020, the company launched the X5 Router, the world's first 5G-enabled router which delivers more than one gigabit of data per second to a moving train, using only 4G and 5G mobile networks. It was successfully tested on the Stockholm-Gothenburg line. This exceeded the benchmark known as the "Gigabit Train". Icomera's onboard connectivity solutions serve millions of passengers and tens of thousands of onboard systems in Europe and North America day-in day-out. Deutsche Bahn trains, for example, were equipped with Icomera Passenger Wi-Fi for the first time in 2016, and Icomera devices are being installed in an ever increasing number of new trains. Icomera estimates that across Germany, up to 500,000 passengers connect to Icomera Wi-Fi every day.

Operations control and passenger information system

EQUANS' Navineo is a CAD/AVL (Computer Aided Dispatch/Automatic Vehicle Location) system which provides public transport operators with a wide range of functions, such as incident reporting, Voice over IP (VoIP) communication and a passenger counting system. The passenger information system includes visual and audio information in the vehicles as well as passenger information at stops and via mobile radio and the internet. The Navineo operations control system is in use in over 50,000 buses and trains worldwide.

EQUANS SAS ⚑ Halle 22 | 340

Final sprint to finish the new Wendlingen-Ulm line

Bossler tunnel segment lining after driving. Photo: PORR Bau GmbH

At the end of January 2022, Deutsche Bahn switched the power on along the entire new Wendlingen-Ulm line. Test runs began in February, and in December the line is scheduled to go into operation with the Albaufstieg section upgraded by PORR Bau GmbH.

The Stuttgart-Ulm railway project is part of the Trans-European corridor Paris-Budapest. By upgrading it to a high-speed line between Stuttgart and Ulm, the redesigned existing sections of the line as well as the newly built ones will meet the highest requirements of a modern railway connection. This large-scale project includes the new construction and expansion of the railway infrastructure in and around Stuttgart as well as the adjoining new line from Wendlingen to Ulm, which, as a high-speed line, will significantly reduce travel times.

A combined solution for the Albaufstieg

The Albaufstieg section is part of the planning approval section (PFA) 2.2 on the new line from Wendlingen to Ulm. With a length of about 8.8 kilometres, the twin-tube railway tunnel is the largest structure in PFA 2.2. With a gradient of 2.5 percent, it crosses the Jura rocks characteristic of the Swabian Alb. Originally, the entire Bossler tunnel was to be excavated conventionally by blasting. However, a complete excavation by means of a tunnel boring machine (TBM) had been ruled out in advance, in particular on the basis of stratigraphic conditions characterised by high levels of pressure. By means of a supplementary offer from the Albaufstieg Tunnel Consortium (ATA) under the leadership of PORR, a combination solution of mechanical driving by means of a TBM and conventional partial driving in shotcrete construction was submitted as a special proposal and commissioned by Deutsche Bahn. A TBM with a drive power of 4,550 kilowatts was used to excavate the east tunnel between April 2015 and the beginning of November 2016. After the machine was converted to the conditions of the adjacent west tunnel, tunnelling was resumed in mid-April 2017 and successfully completed at the beginning of June 2018 after best weekly tunnelling performances of up to 214 metres. Once the connecting structures, the interior fittings and the portals had been completed, the individual components of the Bossler tunnel were handed over to the subsequent trades for railway equipment in the second half of 2020. In addition to the Bossler tunnel, the approximately 4.85-kilometre long twin-tube Steinbühl tunnel, another part of the Albaufstieg, was also constructed under PORR's supervision using conventional shotcrete construction methods with a subsequent in-situ concrete inner lining.

Sophisticated tunnelling concept

The ARGE ATCOST21 consortium, also led by PORR, is also constructing the approximately 9.5-kilometre long twin-tube Filder tunnel from Stuttgart's main railway station in the direction of the airport and the Ober- and Untertürkheim access with two approximately 6-kilometre long tunnel tubes. The access tunnels to Ober- and Untertürkheim are the first four mined under-crossings of the Neckar in conventional shotcrete construction, the distance to the river bottom was between 8.5 and 18 metres. The excavation concept of the Filder Tunnel followed a special proposal of the PORR tunnel builders, in which the TBM was pulled through the 1.1-kilometre long "middle Filder tunnel" and reversed underground before the last shield drive. In only three months, the complete tunnelling unit was transferred to the neighbouring tube. A particularly spectacular event was the two days during which the shield section, which weighed about 1,400 tonnes and was almost 11 metres high and wide, was turned around through the almost 12-metre wide and 13-metre high turning cavern. These new types of shifting and turning operations for a TBM including trailer and logistics were among the project highlights for all those involved.

At the Filder tunnel and at the Ober- and Untertürkheim access routes, PORR is also carrying out the subsequent works for the installation of the slab track including a mass-spring system in some tunnel sections, the safety lighting in the tunnels and extensive cabling work. PORR is thus successfully represented as a comprehensive project partner in all relevant service areas.

PORR Bau GmbH ⚑ Hall 25 | 410

FOCUS ON

TUNNEL CONSTRUCTION

Safe connection

The issue of safety in tunnel construction begins with the identification of its alignment. With core sample bores and their evaluations, the preferred variant can be identified. Specifically targeted construction materials help to stabilise the ground during the construction phase. Operations are safeguarded by using adapted electrical installations to cope with the tunnel climate, as well as a clear and reliable emergency and safety lighting system and an effective fire-fighting system.

Water mist fire fighting systems safeguard human lives and tunnel structures

Full fire test of a water mist fire-fighting system with a reconstructed lorry. Photo: FOGTEC Brandschutz GmbH

The devastating tunnel fires of the past which claimed numerous lives have shown that large fires can occur even in modern tunnels, and they may have the potential to develop in a dramatic way. As the fire grew rapidly in size and radiated heat, a manual intervention by fire brigades was often not possible any more. Motorists and also the operational capability of the fire brigades were at considerable risk. In many cases, the fires damaged the tunnel structure so severely that the subsequent repair work required long closure times. FOGTEC Brandschutz GmbH has carried out research projects to investigate the effectiveness of water mist fire fighting systems.

The fire risks in connection with the safety of human lives, the safety of fire brigades and the protection of tunnel structures are sufficiently well known and the specifications, especially with regard to the safety of persons and the protection of structures, are recorded in sets of rules. In order to fulfil these, various concepts and fire protection measures can be implemented.

For about 20 years, water mist fire fighting systems (WM-FFS) have been used in selected tunnels to fight large fires. One of the fire fighting agents is usually pure water. Within the framework of research projects funded by the German government and the European Union, FOGTEC has carried out real fire tests in specially designed test tunnels to investigate the effectiveness of the systems.

Reducing life cycle costs

It was shown that WN-FFS significantly reduce the risk of fire by limiting the size of the fire and preventing the spread of the fire from one vehicle to another. In the event of a fire, the cooling effect of the water mist in particular significantly reduces the temperatures around the fire and limits heat radiation. This increases the safety of motorists and firefighters significantly. Increasingly, these advantages of FFS are also being used to protect the tunnel structure.

The availability of tunnels is becoming more and more important. Fires sometimes lead to considerable damage, significant repair costs and long closure times of important traffic arteries. They drive up the life cycle costs of such a structure. FOGTEC's fire fighting systems can shorten the closure times quite considerably.

Tunnels can be reopened to traffic in the shortest time possible. The comparison between maintenance and initial costs of such a system and the increased life cycle costs caused by a fire shows that in many cases the investment in a FOGTEC FFS pays for itself after only a few years.

FOGTEC Brandschutz GmbH ⚑ Hall 5.2 | 733

Light for rail tunnels

In an emergency, handrail systems optimally illuminate the escape route - both in high-speed and rapid-transit tunnels. Photo: NORKA Norddeutsche Kunststoff- und Elektro-Gesellschaft mbH & Co. KG

NORKA Norddeutsche Kunststoff- und Elektro-Gesellschaft mbH & Co. KG offers special solutions for emergency and safety lighting in rail tunnels in addition to the emergency luminaires in its standard range. In doing so, the company draws on its many years of experience as a luminaire manufacturer for difficult ambient conditions and emergency lighting.

In the trans-European high-speed rail system, all tunnels longer than 500 metres must be equipped with a handrail for the self-rescue of persons. Such handrail systems are also increasingly being used in rapid transit and metro systems. In this way, the escape route is optimally illuminated in the event of an emergency and enables people to safely leave the danger zone – in tunnels along both high-speed lines and also in rapid transit systems. It is a particular challenge to ensure the compatibility of the luminaire, the supply unit and the monitoring technology. High vertical manufacturing integration and technical background knowledge enable NORKA to respond to specific requirements and to develop tunnel safety lighting according to customer needs.

Single centrally controlled battery supply

NORKA has specially developed a single battery system for the requirements of public transport applications. In an emergency, single-battery emergency lighting supply units will feed the integrated LED safety lights in the handrail, so that passengers can safely get to the next exit point. The integration into the existing control and monitoring technology enables the central monitoring of the entire system. The functionality and operational availability of the emergency lighting can thus be ensured from a central location.

Lighting optimised for the surroundings

NORKA, a family-owned company founded in 1948 and based in Hamburg and Dörverden-Hülsen, specialises in technically sophisticated lighting solutions tailored to very specific environmental conditions. The main areas of application for NORKA luminaires include industrial and production halls, railway platforms and traffic structures, workshops, multi-storey car parks, façades, port facilities and maintenance pits. The company also produces special luminaires for washing plants, swimming pools, logistics centres and cold stores.

With its new business division for traffic and tunnel lighting, NORKA also offers a broad product portfolio for improving traffic safety. This includes luminaires for entrance and drive-through lighting of tunnels as well as solutions for traffic routing and marking of escape routes. NORKA products are durable, energy-efficient and have a high degree of availability.

NORKA Norddeutsche Kunststoff- und Elektro-Gesellschaft mbH & Co. KG ⚑ Hall 5.2 | 800

Safe electrical installation in tunnels

The handrail made of glass fibre-reinforced plastic guides passengers safely to the exits in an emergency. Photo: AlpTransit Gotthard Ltd.

As in other fields, safety is the top priority in tunnel construction. In order to ensure that the power supply is maintained in an emergency, cable laying system manufacturer Niedax GmbH & Co. KG offers specially adapted electrical installation solutions for tunnel conditions.

Fire and corrosion protection, mechanical strength and low thermal conductivity are the most important requirements for electrical installations in tunnel systems. These requirements can be met with products made of stainless steel and glass-fibre reinforced plastic. For this reason, the cable laying system manufacturer Niedax has developed solutions for two of the largest tunnel projects in the world, the construction of the Gotthard and Ceneri base tunnels, which meet the high safety requirements of tunnel construction.

Safe cable routing in the world's largest tunnel project

An efficient and safe electrical installation in tunnel systems in both tunnel projects depended on the early involvement of the specialised project partner for cable laying systems. In both cases, Niedax was involved from the very beginning, from engineering to issues related to cable laying through to their installation. As a family-owned company headquartered in Germany, Niedax has over 100 years of experience in carrying out large-scale and special projects.

New materials and experience through tradition

In the Gotthard base tunnel alone, around 8,000 metres of stainless steel cable trays and 60,000 special support structures were installed. In addition to the fire- and corrosion-proof stainless steel systems, there are also over 120,000 metres of self-rescue handrails made of glass-fibre-reinforced plastic (GRP). This tactile guidance system leads passengers quickly and safely to the emergency exits in the event of a fire with smoke development or in other dangerous situations. GRP is stable, temperature-resistant and dimensionally stable. In the event of a fire, no toxic gases are produced due to the use of halogen-free materials, which are also flame-retardant and self-extinguishing.

Tailor-made products for tunnel construction

Niedax products were also used in the Ceneri base tunnel, the feeder tunnel to the Gotthard base tunnel. Like the Gotthard base tunnel, this also consists of two single-track tubes, which are about 40 metres apart and connected to each other every 325 metres by cross passages. Niedax solutions are used in all cross passages, whether in the form of specially developed double floors or cable laying systems.

Individual solutions

Despite all the experience gained in tunnel projects, each tunnel is unique. For this reason, those responsible for the electrical installation also have to individually adapt to the respective conditions. All solutions must withstand extraordinary loads, which requires a high degree of product quality and installation competence. It is therefore important to involve experts for safe electrical installation at an early stage in every tunnel project. In this way, intelligent solutions can be found which ensure the power supply in the tunnel even in an emergency.

Niedax GmbH & Co. KG | Hall 5.2 | 810

Tunnelling with a protective shield

An underground protective screen made of acrylate gels secures the advance. . Photo: TPH Bausysteme GmbH

In modern tunnelling, the condition of the ground to be excavated plays a decisive role in terms of cost, speed and, last but not least, in the safety of the construction project. The engineers who built the Vötting tunnel in Bavaria were faced with a particularly tricky task in this respect. To find a solution, they called in the injection specialists from TPH Bausysteme GmbH.

The tunnel was not only to be built directly under an already built-up area with an overlay of just eight metres in some places. Moreover, the composition of the encountered soil proved to be very challenging, as it consisted of clearly over-consolidated, tertiary loose ground with gravels, sands, silts and clays in varying composition and distribution over the height of the tunnel. An extremely unstable combination which is difficult to control in a mined tunnel construction.

It was therefore essential to first secure the ground in a stable and reliable manner. Together with the experts from TPH Bausysteme GmbH, the tunnel engineers and technicians decided to erect a so-called special protective screen in the underground to secure the digging and subsequent casting of the tunnel. For this purpose, a precisely calculated pattern of four-metre-long, partially perforated pile-driving spiles was driven slightly upwards into the ridge of the working face, which were then compacted with acrylate gels which were specially adapted to the respective ground conditions, after which the next metres of the tunnel could be dug and concreted.

Optimised use of acrylate gels

Since some of the rock sections had very high cohesive properties, the use of injection cements was impossible. Instead, two acrylate gels from TPH were used as grout. These gels can be applied to improve a wide range of fine sandy and silty soils. The specialists can conveniently and directly optimise their properties at the construction site to suit the particular local circumstances. Firstly, TPH Rubbertite, a highly flexible low-viscosity injection gel which is approved for groundwater hygiene and has a high long-term stability, and secondly, TPH Variotite, which is a low-viscosity and highly flexible injection gel with a very high elongation capacity.

By using a pile-driving screen made of acrylate gels which was optimised for the respective construction section, the tunnel in Vötting could be completed safely, economically, environmentally friendly and quickly even in this challenging location – further proof of the amazing advantages of highly specialised construction materials from the laboratory.

Into the future with the Nightjet

The new generation of Nightjet sleeping cars.

Photo: ÖBB/Siemens Mobility

Environmental awareness, a sense of adventure or a business meeting – there are many reasons to travel by night train. To satisfy the great demand, the Austrian Federal Railways (ÖBB) are expanding their fleet and focusing on more comfort and privacy.

Glide through the darkness, be gently rocked to sleep and arrive in another city, with breakfast in bed included. Night train journeys are trendy, and ÖBB recognised this in good time. Since 2016, they have been expanding massively – today they are Europe's largest provider of night trains with currently 20 night connections. In addition, there are nine connections with partner railways – in the next few years there will be 26 under their own management.

Overnight to another city

Just in time for the travel summer, under the motto "Dream now. Enjoy tomorrow", the light is green for all international Nightjets. Destinations such as Venice, Rome, Zurich, Hamburg, Berlin and Amsterdam and the new connection to Paris are enjoying great popularity. Within the next two years it will be possible to reach thirteen major European cities by new night trains. The executives of ÖBB, Deutsche Bahn, Swiss Federal Railways and the French SNCF signed a joint declaration to this effect. It is part of the concept "Trans-Europ-Express TEE 2.0", which aims to revive old rail connections between the metropolises.

Less CO2, more comfort

Preserving natural resources is one of the declared goals. By replacing long-distance flights or long car journeys, night trains are an environmentally friendly choice. A comparison reveals that they cause only a fraction of the CO_2 emissions. 100 percent of the traction power in Austria comes from renewable energy sources, almost entirely from hydropower. Night trains are popular. They save costs for overnight stays in hotels - and exclusivity is included.

The future of mobility

Not only the destinations, but also the Nightjet trains themselves are becoming more and more attractive. ÖBB has ordered 20 more seven-car night trainsets from Siemens Mobility to expand its Nightjet fleet, and by 2025 there will be a total of 33 new-generation Nightjets on the rails. The new, ultra-modern sets will be put into service next year, in the first stage primarily on the connections from Austria and Germany to Italy. The trains consist of two seating cars, three couchette cars and two sleeping cars. They combine modern design with a great deal of comfort.

The couchette concept offers more privacy for single travellers in additional mini cabins. Sleeping in the sleeping car will be even more comfortable, as in future the standard and deluxe compartments will have their own toilet and shower facilities. A new feature on board is free WiFi, which was previously limited to the Railjet day trains in long-distance travel. Barrier-free overnight travel will also become even easier. Each Nightjet will be equipped with a multifunctional carriage, which has a low-floor entrance and a barrier-free couchette compartment including a toilet. ÖBB concludes: "The renaissance of night trains has already begun thanks to the red-white-red pioneering role – and will redefine the future of travel."

ÖBB | City Cube Berlin | 630

Dishwashing in the train: Everything is dry

In the confined space of an on-board train restaurant, things have to move fast, especially when it comes to washing up. Used glasses, cups, cutlery and plates have to be available again in no time – clean and as dry as possible. There is not much time or space for manual drying. For this purpose, the German company Hobart GmbH, based in Offenburg, brings the compact, railway-specific GPC dishwashing machine into the game.

With its integrated TOP-DRY drying system, the GPC dishwasher ensures that the dishes are readily dry for the cupboard and can be put away directly after the washing process. This saves time and makes everyday work easier for the on-board staff. In addition, the machine feature VAPOSTOP² creates a pleasant climate in the galley. It eliminates the hot steam which otherwise escapes during the rinsing and drying process as well as when the dishwasher is opened. The VISIOTRONIC-TOUCH control system with single-button operation also facilitates the work processes of the on-board service.

Instruction times can be minimised and operating errors are avoided at the same time. Short rinsing times, guaranteed rinsing results and low water, energy and chemicals consumption round off the machine's performance spectrum.

Reusable ware-washing made easy

From 2023, there will be a Europe-wide obligation to offer reusable containers for takeaway in addition to disposable dishes. More and more passenger trains with catering services are therefore already using washable plastic cups and dishes. However, washing reusable containers requires a special technique. Here, too, the PREMAX GPC and its drying system make the washing process noticeably easier. In combination with the appropriate cleaning chemicals and the HYLINE HLP-7000 plastic rinse aid, the units guarantee perfect cleaning and drying results.

The right basket is just as important for holding the lightweight plastic cups and lids in place when washing them in the dishwasher. Hobart-designed basket systems, such as the reusable cup basket for up to 25 cups, ensure that the lightweight containers maintain their position during the dishwashing process, ensuring perfect cleaning and drying.

Everything under control with the SmartConnect app

With Hobart's SmartConnect app, on-board staff and the technical control centre can call up comprehensive information on the status of the dishwashers. In addition, Hobart offers the appropriate instructions for rectifying minor faults in the app. Thanks to the quick installation slide specially developed by Hobart, the dishwasher can be removed from or installed in the counter area of the on-board restaurant in just a few steps. In this way, the machine can be quickly removed and replaced in the event of major problems.

Hobart GmbH | Hall 1.1 | 792

The GPC dishwashing machine from Hobart for narrow galley areas.

Graphic: Hobart GmbH

Not boring at all

Winner of the 2021 Not-A-Boring Competition in Las Vegas: TUM Boring and their tunnel boring machine. Photo: TUM Boring

Last September, students from the Technical University of Munich (TUM) and the Munich University of Applied Sciences (HM) proved in Las Vegas that tunnels can also be built faster than at a snail's pace. In Elon Musk's "Not-A-Boring Competition", they won the first place in the international tunnel-boring race. They continue to work on the speed of tunnelling in the association TUM Boring – Innovation in Tunnelling e.V. and are planning their own "European Tunnelling Week" with the three other European finalists.

For Elon Musk, the solution to the traffic problem lies in the underground. The entrepreneur sees tunnel networks as an opportunity for high traffic throughput, making traffic jams a thing of the past. Underground regional high-speed connections could transport passengers and goods from one point to another. On the surface, more space would be available for the community. The only problem is that tunnel construction takes a long time. Today's tunnel boring machines proceed slower than a garden snail, he describes the crux. With his company "The Boring Company", he therefore launched a competition in July 2020. The call "Can you beat the snail?" asked international teams to take part in the "Not-A-Boring Competition" tunnel-boring race. The competition required the teams to drill a 30-metre-long tunnel with a diameter of 50 centimetres as quickly and precisely as possible for the finale in Las Vegas in September 2021.

The students from TUM and HM had one year to prepare for the competition. "A new development involves a long lead time, which is why we focused on driving and on recombining existing components," says mechanical engineering student Isabell Nuißl, as she explains the project's approach. By September 2020, 60 students had come together for the ambitious project and formed seven sub-teams within the two areas of "technology" and "organisation". Isabell Nuißl was part of the tunnel structure sub-team and was jointly responsible for the design and calculation of the tunnel tube segments, the tunnel structure and the steering of the tunnel boring system. Her main field of study until then had been the construction of large machines.

Great interest from the industry

The students also had to acquire partnerships and sponsors for the project as part of the competition. Nuißl, now 24, was amazed at how great the interest and willingness to cooperate on the part of the industry was. With the TUM as its patron and almost 50 partner companies from industry, as well as nearly as many supporters, the project was well positioned. The students were able to exchange ideas with some of the companies, while others provided support in kind. "All of a sudden, thanks to the support of industry, we had steel for a five-digit amount," Nuißl is still happy today. The young people worked for 70, 90, or 100 hours a week to achieve their goal, and they did so despite tougher conditions. For months, due to the pandemic, the weekly exchange took place remotely in front of the computer. They were determined to win the competition in Las Vegas under all circumstances.

In January 2021, TUM Boring, the name the students had given to their association, sent their design document to The Boring Company. As one of twelve teams out of 390 international applications, they were awarded the contract for the final in Las Vegas.

In just three months they built the tunnel boring machine, then tested it in a gravel pit in the north-east of Munich. In July 2021, the machine completed a first tunnel with the competition distance of 30 metres. The second tunnel was created in the USA during a test drilling - after being dismantled, transported across the Atlantic for six weeks and rebuilt at an industrial partner near Houston.

A total of eight teams made it to the competition finale in Las Vegas. However, only two cleared the final hurdle, the extensive safety tests: the Swiss Federal Institute of Technology ETH Zurich and TUM Boring. In the end, however, the German team competed alone. The Swiss team had not been able to finally assemble the not quite finished drill at the venue.

The TUM team also had starting difficulties, but was able to solve the problem after an hour and a half.

The tunnel boring machine

The students had decided to use the industry-standard pipe jacking method. For optimal bearing during the long ship transport and the greatest possible speed during tunnelling, they designed a bearing based on the revolver principle for the pipes and all tunnel segments. A motor-driven cogwheel system turns the revolver. During a pipe change, the revolver ran without stopping until the new position was reached. The transport system for the overburden consists of six conveyor belts integrated into the pipes and a screw conveyor for the removal of the excavated material. The cutterhead is constituted of a cutting wheel, a rotating drum, a housing, a sealed bearing, a mechanical surface seal, a hollow wheel, four synchronous motors and the auger screw. It is driven by water-cooled synchronous motors with self-designed cooling plates.

This allows the highest possible power density of the boring head to be achieved in the smallest possible space, the TUM Boring team concluded. A hydraulic steering system with numerous sensors and a laser measuring system keep the cutterhead on the specified track. Finally, the control system evaluates the signals from the almost 30 sensors and 15 actuators. It is implemented on a modern programmable logic controller. The propulsion system consists of two clamps, each driven by four hydraulic cylinders. In continuous mode, the system achieves a tunnelling force of up to 500 kilonewtons, which is roughly equivalent to the weight of a mass of almost 51,000 kilograms.

The finale in Las Vegas

The tunnel boring machine from TUM Boring drove 22 metres through the Nevada desert during the finale. For the first 15 metres, it reached a peak rate of one centimetre per second. "That's significantly faster than a snail, which creeps two to three millimetres per second," says Nuißl. "However, over the entire six-hour period, including the one-and-a-half hour delay, we were slower than a snail. In the end, we hit some very, very hard geology." Still: they beat the snail and took the first place in the "Not-A-Boring Competition". After the success in Las Vegas, the non-profit association TUM Boring - Innovation in Tunneling e.V., which is made up entirely of volunteering students, is entering its second generation. Boring tunnels faster than before remains their goal. The optimisation of the drill head torque has top priority.

In the meantime, The Boring Company has announced the 2022-2023 competition. The TUM Boring team, which will then be rejuvenated, will apply again. It is also planning its own tunnel event for the autumn with the other European finalists, Swissloop Tunneling (ETH Zurich), Dirt-Torpedo (Duale Hochschule Baden-Württemberg DHBW Mosbach) and The Warwick Boring Team (University of Warwick).

Isabell Nuißl has completed her Bachelor's degree in mechanical engineering after working full-time at TUM Boring. In March she began studying for her Master's degree and continues to be involved in the team. In the tunnel project, she was able to put into practice what she often found difficult to imagine in theory before. She now has caught fire: "The topic is currently at the top of my list."

Isabell Nuißl, mechanical engineering student, responsible for tunnel structure at the TUM Boring. PHOTO: private

MES Expo showcasing at InnoTrans

The MES Expo team conducts tours to selected electronics suppliers.

Photos: Messe Berlin GmbH

Focus on the electronics supply industry: from award to themed tours.

The B2B trade fair MES Expo will also be present at InnoTrans with a booth in the Railway Technology segment. As a cross-transport system platform, MES Expo is specifically aimed at the rail vehicle, commercial vehicle and automotive industries. In 2023, the international trade fair will again be held physically at the exhibition centre in Berlin. "The electronics sector in the mobility industry is growing and has a rapid innovation cycle. MES Expo is the first trade fair to specialise in this area across all modes of transport," explains Lisa Höfer, MES Expo Project Manager.

Networking and themed tours

At InnoTrans, MES Expo offers the opportunity to make contacts and to exchange views on current topics in the electronics supply industry. The MES Expo team invites participants to a business breakfast and will conduct themed tours. Participants will visit selected electronics suppliers who are exhibiting at InnoTrans. Every visitor to InnoTrans can take part in the tours. Exhibitors who wish to be visited should register on the MES website.

Siemens Mobility Supplier Award honours its outstanding suppliers

The presentation of the Siemens Mobility Supplier Award will be a special highlight at InnoTrans. The award aims to honour outstanding achievements, inspire suppliers and share best practice examples. It recognises suppliers who have made a significant contribution to the success of Siemens Mobility in the current financial year – in the categories Technology & Innovation, Logistics Performance, Competitiveness, Quality, Sustainability and Moving beyond.

MES Expo | Hall 15.1 | 140

Successful and safe bonding processes

In addition to its products, Sika offers various elements for the implementation, control and traceability of safe and successful bonding processes.

Photo: Sika Deutschland GmbH

In utility and rail vehicle construction, stable and reliable bonding processes can prevent both component failure and damage. Sika Deutschland GmbH supports its product users in the smooth execution and optimisation of manufacturing processes. In addition, well-matched products, in combination with a competent technical service which supports all development and production phases, facilitate an optimal process control.

Studies and experience feedback show that most errors in bonding are due to deviations from process specifications or to an insufficient level of process control. The Stuttgart-based adhesives manufacturer Sika not only produces and supplies high-quality adhesives and sealants, but also provides the necessary tools and product technologies. Before, during as well as after the bonding process, the products and services enable a comprehensive control and quality assurance.

Components and processes

The interaction of coordinated components ensures successful and safe bonding processes. These include pre-treatment agents which are visually detectable after application. Sikaflex® Booster Technology adhesives, which allow maximum flexibility in the process, and SikaForce® adhesives. They are based on the Powerflex technology with a long open time and fast curing to optimise the time management.

The data matrix code on the containers enables a digital traceability of the applied products. In addition, Sika offers individual services, such as support in the selection of suitable application methods, as well as material compatibility, ageing and adhesion examinations based on international standards. A regular and comprehensive product training is offered to users at the customer's site.

Adhesive bonding can be designed and dimensioned according to the level of relevance regarding safety, while processes are established, safeguarded and optimised in the production of adhesive bonding materials. Sika facilitates the implementation of common quality assurance standards and provides proof of safe function. Users can prove and document their manufacturing processes in accordance with the requirements of currently applicable quality standards for bonding, such as DIN 2304 (new ISO 21368) and DIN 6701 (new EN 17460).

Expert competence and quality assurance

When it comes to safety-relevant and durable bonded joints in the construction of rolling stock, there is no alternative to a competent mastery of bonding processes. Bonding expertise, proven adhesives and pre-treatment agents are one prerequisite. Another one is the availability of well-trained personnel in combination with a practiced quality assurance - used professionally in the application and documented by certifications. Altogether, this minimises errors, saves money, creates trust and increases the successful use of bonding technology.

In the White Paper "Successful and safe bonding processes" Sika lists its various elements to support the implementation, control and traceability of safe and successful bonding processes.

Sika Deutschland GmbH | Hall 8.1 | 355

Smart maintenance – quick results without great effort

Countless valuable data are already measured and collected in the railway industry. Smart maintenance can help to fully exploit their potential. Photo: ITK Engineering GmbH/Shutterstock

Digitalisation is currently fundamentally transforming the railway industry and enabling new business models. As in many other industries, data from all kinds of measurement and diagnosis systems are already being collected on a large scale. However, a large part of the potential of these data currently remains unused. The ITK Engineering GmbH data lab makes use of these data.

Smart maintenance in the railway industry makes it possible to exploit this potential. Potential areas of application include the optimisation of existing maintenance processes, the reduction of life cycle costs and the implementation of new business models and services. Explorative data analyses can reveal the hidden potential and complex dependencies for rail vehicles as well as for infrastructure. By combining the results with knowledge about operations and maintenance, it becomes possible to find relevant use cases.

New insights from existing data

Experts from ITK Engineering are working on this. A practical example of exploratory data analysis can be shown by looking at the S-Bahn fleet of one of their customers. A modular machine learning data pipeline was applied to a large data set from an existing onboard data diagnosis system.

In this process, use cases were extracted and insights were generated from an existing data set without any additional effort for data retrieval. The objective of leveraging potential from unused data was achieved with the help of a data lab pre-developed by ITK and use cases were validated for automatic defect detection and predictive maintenance.

The ITK Data Lab helps with initial analyses using artificial intelligence. In this way, potentials to achieve smart maintenance procedures can be quickly identified. Thanks to the modular structure and the high degree of automation fast results with a short runtime as well as low costs can be achieved. In addition, a tried and tested structured procedure was used so that value can be added as quickly as possible.

Models enable proactive planning

The S-Bahn trains have a remote tool for diagnosing and monitoring their door systems, which permanently collects diagnostic messages. On this basis, models were trained and evaluations and visualisations were created. The new procedure enables a faster automatic detection of 30 percent of the failures. This provides the operator with increased availability of the doors and helps to improve the planning of maintenance.

Smart maintenance is one of the innovative core topics and a direct result of the progressing digitalisation in the railway industry. Costs can be reduced with a significant increase in the availability of rolling stock and infrastructure. Maintenance systems are evolving from reactive behaviour after component failures or strict time-based cycles to proactive maintenance. Railway systems are different, yet smart maintenance can be tackled with a structured approach. Initial results can be achieved quickly and without great effort.

ITK Engineering GmbH | Hall 20 | 320

Compact connection technology for railways

Thanks to a new double-fork connector from Stäubli Electrical Connectors GmbH, it has now become possible to connect two conductor rails simultaneously. The connector is mainly used in distribution and control cabinets with a current requirement of 100 up to several thousand amperes. With a high level of compensation for misalignment and a flexible design, it provides cost-effective solutions and allows adaptation to individual requirements. Being designed for up to 5,000 mating cycles, it minimises maintenance and replacement costs.

Be it for power supply, power electronics or storage technology, wherever busbars need to be connected, Stäubli's MULTILAM contact technology ensures the lowest contact resistance and a very high current density, while maintaining a high and constant performance. The wide range of single-ended fork connectors and double-fork connectors for railway applications enables compact and powerful solutions for infrastructure and rolling stock applications.

For the electrical connection within the traction chain and for on-board power applications, such as traction converter and battery outputs or the connection between the car body and the engine, the Modular Power Connector MPC is used in a wide variety of rail vehicles. Modular and compact, it reliably transmits high voltages and currents.

The modular connector system CombiTac is used on the one hand as a powerful solution in battery packs and battery management systems, and on the other hand to feed traction motors with power. Thanks to its hybrid, individually configurable design, CombiTac is a compact solution for control and communication systems as well as for testing applications.

Customised solutions which exactly fit the spatial and technical specifications, as well as ready-to-install package solutions including cable assembly, simplify the integration, save assembly costs and reduce the logistics effort.

Miniature to high-performance connectors

The international Stäubli Group, headquartered in Pfäffikon, Switzerland, stands for mechatronic solutions in the three core areas of connectors, robotics and textile. Stäubli employs more than 5,500 people worldwide, is present in 29 countries with production, sales and service subsidiaries and is complemented by representations in 50 countries.

In the field of connectors, Stäubli is the world market leader in the production of fast coupling systems for all types of fluids, gases and electrical energy.

The Electrical Connectors product portfolio (formerly Multi-Contact) ranges from miniature to high-performance connectors for power transmission, automation industry, transportation, test and measurement. In photovoltaics, Stäubli is the world market leader with its MC4 connector components. The MULTILAM technology is at the heart of its electrical connectors.

Stäubli Electrical Connectors GmbH | Hall 12 | 350

Contact solutions for busbars and modular connector systems from Stäubli for the railway sector. Photo: Stäubli Electrical Connectors GmbH

On a single rail into the future

The world's longest monorail system is under construction in Cairo. Photo: Alstom/Ezz Production Agency

Worldwide, 84 percent of monorails fulfil a transport task in public transport, and thanks to their economic advantages and shorter implementation times, the trend is rising. In order to promote the efficient use of monorails in public transport, the non-profit member association International Monorail Association (IMA) provides a platform for the exchange of ideas between public authorities, transport operators and the industry.

The world's longest driverless monorail system with a total length of almost 100 kilometres is currently being built in Cairo. The double-track monorail system will significantly improve public transport in Greater Cairo. The 54-kilometre route between the new administrative capital and eastern Cairo will be covered in 60 minutes. The 42 kilometres between 6th of October City and Giza will take passengers only 42 minutes. These are the performance parameters: Both lines will be able to carry around 45,000 passengers per hour per direction. The vehicles will reach an operating speed of 80 kilometres per hour. In addition, the project will be realised in an enormously short time. After the contract for planning, construction and operation was awarded in August 2019, the first line will go into operation in May 2022, followed by the second line in spring 2023. Monorails are thus setting standards for rail-based transport systems.

Alternative monorails

Monorails are not only convincing on greenfield sites; they offer decisive advantages especially in developed or rapidly growing urban areas. The elevated construction reduces the space requirement to a minimum and does not lead to a displacement of existing surface traffic. As opposed to many cases where trams or dedicated bus routes are introduced, monorails fully preserve the capacity of existing road infrastructures. Some monorails manage very small curve radii of as little as 18 metres and gradients of up to 12 percent, making them ideally suited for locations and regions with a challenging topography or urban conditions. Monorails are also among the quietest transport systems. The prefabricated construction of the infrastructure - such as rail beams, supporting pillars and trackside components – which are often manufactured at the gates of a city, enables the structures to be erected quickly and without massive traffic restrictions at the operating site. The crossing-free operation eliminates the need for additional track safety devices outside the stations and allows fully automatic driverless operation according to Level 4 automation.

IMA develops a performance catalogue

In order to further promote the use of monorails, there is a particular need for a tool which enables the evaluation of monorails in comparison to other transport systems in the course of higher-level transport planning or concrete tenders. With the "Technical Performance Specifications", IMA is developing just such a performance catalogue for components, subsystems, vehicles and the infrastructure. This describes the performance of an entire monorail system in a way which enables users to understand what is possible and what can be requested. It also gives the vehicle and infrastructure supply industry a better insight into technology requirements and avoids system-specific isolated solutions. This performance-oriented standardisation will ensure more competition along the supply chain and further strengthen the economic efficiency of the overall system. The first edition of the "Technical Performance Specifications" will be officially adopted at the IMA conference "Monorailex" from 16-18 September in Rust, Germany, and unveiled to the professional public at InnoTrans 2022.

International Monorail Association
Hall 4.2 |100

CleverShuttle – Efficient operation of on-demand transports

CleverShuttle's digital platform for the operations control of on-demand transport . Photo: CleverShuttle

The modernised German Passenger Transport Act has permanently integrated "on-demand ride-pooling" into short-distance public transport. Digital on-demand services, which can be ordered and tracked via an app and use an intelligent algorithm to generate carpools, play a key role in increasing the attractiveness of public transport.

According to a recent study by ioki, a Deutsche Bahn subsidiary, almost 55 million Germans who live in rural areas do not have sufficient access to public mobility. This is where on-demand transport services provide a basic supply of public mobility. They are an efficient alternative to poorly utilised scheduled and on-call bus systems. They can also be used as feeders to the next connecting service. In cities, they complement urban public transport by closing gaps in coverage at off-peak times or in peripheral areas and provide customised, high-quality mobility offers. With on-demand transport, future connections can be created without lengthy advance planning and development of infrastructure.

This potential is increasingly being used by transport companies. In 2021, more than 30 new on-demand services were launched in Germany – more than in any other country outside the USA. There are currently around 380 on-demand shuttles on the road in public transport throughout Germany. According to the Association of German Transport Companies (VDV) and the consulting group Roland Berger, 18,000 vehicles are anticipated by 2030.

Efficient operation – the key to success

In the long term, however, on-demand transport can only be successful nationwide if it is implemented efficiently. This is because it requires a high level of resources. Manpower, vehicles and charging infrastructure – in the case of electrically powered transport – must be optimally coordinated so that requests for journeys can be served quickly and the vehicles are always fully utilised. On behalf of public transport, CleverShuttle optimises these resources, from the provision and training of driving crews, the procurement of electric vehicles to the installation of the charging infrastructure and intelligent traffic management.

A digital platform to control operations

With its proprietary digital platform for operations control, CleverShuttle implements on-demand transports through data-driven and intelligent control. Based on a large data pool of passenger usage patterns, an hourly demand forecast is first created and then translated into precise service planning for on-demand transport. To ensure that drivers and vehicles are deployed efficiently at all times, the digital operations platform consolidates all aspects of operations management, such as dynamic shift planning, active vehicle distribution, incident and load management, and live operations adjustments, into one simple dashboard for dispatching.

CleverShuttle's own software solution handles the work processes of its driving personnel in a fully digital mode. The driving personnel performs all work steps intuitively via their smartphone. They register online for their shift, check the vehicle condition and view their pay slips. This minimises set-up times.

CleverShuttle currently operates on-demand transport services on behalf of local public transport companies at eleven locations across Germany with a fleet of more than 70 vehicles and over 150 drivers. The average rating by passengers is 4.9 out of 5 points and the average waiting time for a shuttle is less than seven minutes.

At InnoTrans 2022, an interactive multi-touch display will provide insights into all aspects of the operational implementation of digitised on-demand public transport services.

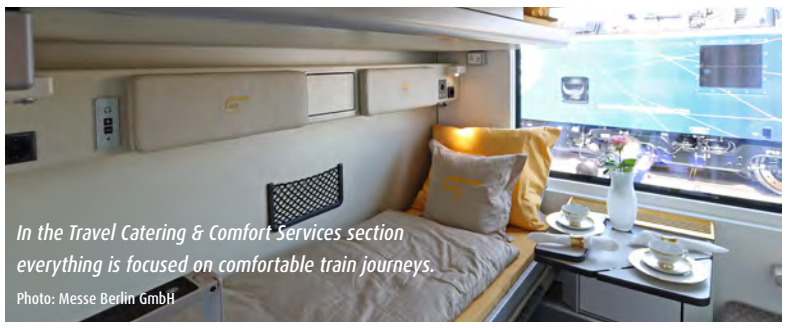
CleverShuttle Hall 7.1c | Mobility+ | 210

Travel Catering & Comfort Services – More comfort on trains

Exhibitors present their products and services for train gastronomy. Photo: Messe Berlin GmbH

Those who feel good will come back. Around 20 exhibitors in the Travel Catering & Comfort Services (TCCS) section will be showing how rail journeys can be a more enjoyable experience for passengers.

At InnoTrans, Deutsche Bahn will be demonstrating how travelling in city areas can become even more comfortable with the "Ideenzug City" (City Idea Train). The S-Bahn of the future will be welcoming visitors at the south entrance of the exhibition grounds. As with the already existing "Ideenzug Regio", the innovative interior concepts can be adapted to passengers' needs. For example, the seating and standing areas can be changed at the touch of a button. During rush hours, they offer more standing room with standing supports, and during times with fewer passengers, the comfort mode creates more seats.


In the Travel Catering & Comfort Services section everything is focused on comfortable train journeys. Photo: Messe Berlin GmbH

TCCS Route – Step by step to passenger comfort

The importance of putting passengers at the centre of rail travel is also demonstrated by the about 20 exhibitors in the Travel Catering & Comfort Services section. A special themed route highlights the participating exhibitors. Footprints on the hall floor, symbols in the hall plans, the InnoTrans app and the flyer for the route indicate the way. From high-quality food and drinks to hygiene articles and sleeping cabins, visitors can examine all the innovative products and services. At InnoTrans PLUS, the virtual exhibitor area, the "TCCS Route" category also includes all participating companies such as ÖBB Nightjet, ITC Italcarelli, MULTI RAIL SRL, Selecta and Winkler Design.

TCCS Route ⚑ Hall 1.1

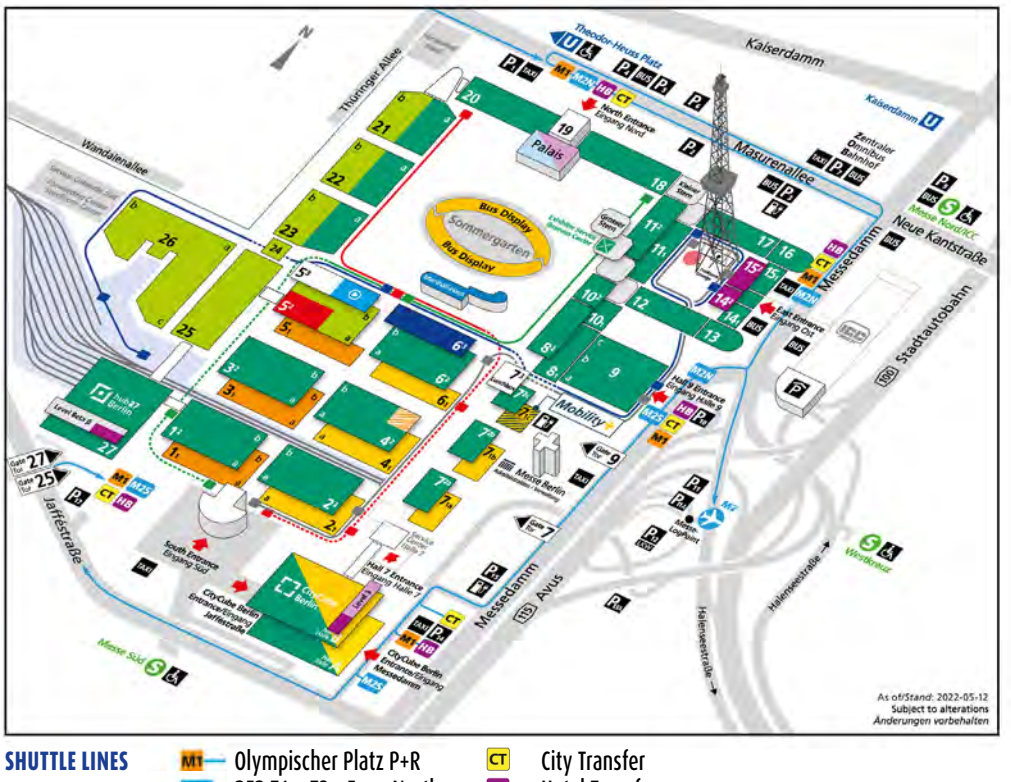
Your direct way to us: the Online Ticket Shop

Day/permanent and student tickets for **InnoTrans 2022** are available in the ticket shop. The tickets are available on mobile devices and allow contactless access. They will also entitle the holder to use Berlin's public transport system (ABC) free of charge for the period of validity.

Online trade visitor pass	Online
Day ticket	50 euros
Permanent ticket	75 euros
Day ticket for students	13 euros

TICKETS ONLINE ONLY!

Ticket sales and voucher redemption will take place exclusively online. At the event, there will be no box office.



SHUTTLE LINES

- M1 Olympischer Platz P+R
- M2N BER T1 + T2 – Expo North
- M2S BER T1 + T2 – Expo South
- CT City Transfer
- HB Hotel Transfer

Exhibition grounds InnoTrans 2022

- Railway Technology
- Interiors incl. Travel Catering & Comfort Services
- Railway Infrastructure
- Tunnel Construction
- Public Transport incl.
- Mobility+ / Mobility+ Corner
- Outdoor Display
- Bus Display
- Opening Ceremony
- InnoTrans Convention
- Speakers' Corner
- Messe Berlin Studio
- InnoTrans Campus
- Business Lounge (Marshall-Haus)
- Press Center
- FoodCourt

FAIRGROUND SHUTTLE

- Fast Shuttle · South Entrance · Hall 18
- South Entrance · Hall 20
- South Entrance · East Entrance
- East Entrance · Outdoor Display

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