DB Systemtechnik
Activity Report
2015/2016

Photos cover: DB Systemtechnik, Hitachi Rail

Our Knowledge - **Your Success**

We have decades of experience in railway
We offer all services from a single source
We know each vehicle
We test each vehicle
We manage your approval process: anytime, anywhere
We are RU, have locomotives and locomotive drivers
We master the railway system

A host of small adjusting screws **add up to a reliable technology**

Satisfied customers and high product quality are decisive prerequisites that enable Deutsche Bahn to remain a profitable quality leader in the long term. On a day to day basis this means tweaking countless small adjusting screws to increase reliability and availability, especially in the technical sphere. This also means, however, introducing innovations into the existing fleet, in order to win over customers with attractive and contemporary vehicles.

Photo: DB Systemtechnik

For this purpose the rail sector requires a competent and impartial partner established throughout Europe.

DB Systemtechnik is facing the challenges and demonstrating its unique range of services in the European rail sector by means of many examples, ranging from the qualification of new suppliers and components, through the acceptance runs in the Gotthard Base Tunnel, to the test runs for Hitachi Rail in the United Kingdom.

This time I would like to draw particular attention to all our activities in connection with the introduction of the ICE 4 in Germany, whether they involve test and trial runs, stationary tests or the adaptations carried out in workshops at various depots. The contribution of hundreds of DB Systemtechnik employees has ensured that nothing stands in the way of the punctual commissioning of the trains.

Yours, Hans Peter Lang
general manager
DB Systemtechnik GmbH

Content

Photos: © AlpTransit Gotthard AG, SIEMENS AG

The Highlights of **DB Systemtechnik**

from Germany, Switzerland, Finland, Denmark und Great Brittain.

Photo: DB Systemtechnik

News

Test run for acceptance of the overhead line in the Gotthard Base Tunnel: ICE-S in the world's longest tunnel

DB Systemtechnik supports AlpTransit Gotthard AG during commissioning of the Gotthard Base Tunnel. During high-speed trials in November 2015 the ICE-S attained the planned maximum speed of 275 km/h in the Gotthard Base Tunnel in the course of measurements on the overhead line. This is one of the highest speeds attained by a rail vehicle in Switzerland.

Rhein-Ruhr regional transport association purchases 82 double-decker multiple units

DB Systemtechnik is accompaning the client in the procuring of rolling stock for the Rhein-Ruhr Express and is undertaking the technical controlling as well as the tests and acceptance procedures accompanying construction for 82 Desiro HC double-decker vehicles.

Approval provess for Vectron locomotive in Finland: TSI tests "Interaction between pantograph and overhead line"

Finnish Railways, the VR Group, has ordered 80 Vectron electric locomotives from Siemens. As part of the approval process for use in Finland, DB Systemtechnik performed several certification tests on behalf of Siemens. From May to mid-July 2016 the measurement team at DB Systemtechnik tested the locomotive in several operational situations with regard to noise emission and interaction of pantograph and overhead line.

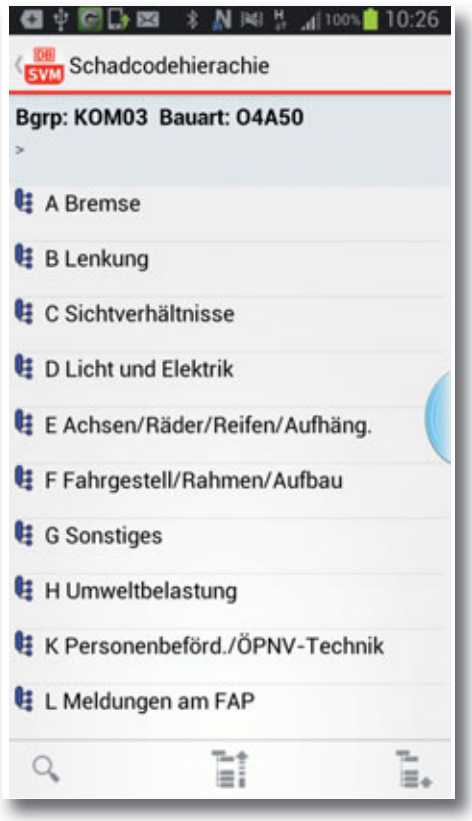
Off for testing in Velim: the new converters for the ICE 2

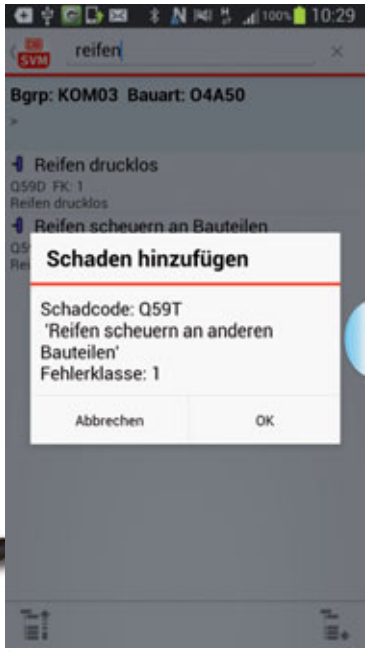
In September 2014 Mitsubishi Electric Corporation was commissioned by DB Long Distance to modernise the traction equipment in the ICE 2 (46 high-speed power cars). DB Systemtechnik is supporting Mitsubishi with the approval of the new technology and performed the first tests with the first ICE 2 equipped in this way on the railway test circuit at Velim in the Czech Republic. The electromagnetic compatibility, the tractive forces and the braking system were tested at speeds of up to 200 km/h.

VT 612 now available as bidirectional track geometry car

The VT 612.9 track recording car used by DB Systemtechnik is based on the standard vehicles of the DB Regio 611/612 series. It is the proven reference vehicle for vehicles with active tilting technology, has two measuring wheelsets for recording the dynamic responses between wheel and rail. It is also used for approvals and regular inspections of the permanent way on railway lines that are used by vehicles with tilting technology from a wide variety of classes. This concerns routes in Germany, Switzerland and Croatia. The measuring equipment previously corresponded to a directional arrangement (instrumented bogie in the leading driver's cab) and the vehicle had to be oriented in the direction of travel by manoeuvring on circular or triangular routes.

A second instrumented bogie with two further instrumented wheelsets of the new generation (without additional mechanical adaptation and with new transmission technology) has now been fitted under the second driver's cab and put into service. This makes it possible to take measurements in both directions of travel without complex additional shunting at stations where trains terminate or can be reversed. The track geometry car is thus significantly more flexible and can perform more measurements each day.





App

New app for vehicle inspectors

Up until a few years ago, vehicle inspectors still had to drag two boxes of equipment on straps around with them in order to notify the depot in advance of any damage to trains. This was very labour-intensive and time-consuming. Today this process takes seconds. Since the spring of 2015, users have been able to switch to the new app. In a pilot project run by DB Long Distance at the locations in Cologne and Hamburg, the two applications – DIVA (digital innovative processing of work orders) and SVM (damage reports) – were tested for the first time on a mobile device.

Any damage is relayed by these devices to the computer for the central integrated maintenance system (ISI). In the workshops this application can be used for reserving material that has already been removed. The SVM app is currently being examined for use by bus companies. Other possible uses will follow.

Photos: DB Systemtechnik

TÜV NORD and DB Systemtechnik close cooperation agreement

Both companies have been established in the approval and testing business for a great many years and have now agreed on comprehensive cooperation. This pooling of competencies results in a substantial synergistic effect for customers. In future TÜV NORD and DB Systemtechnik will offer their customers a complete package: starting with the design, design review, vehicle homologation and vehicle collection at the customer premises through to the assessment of infrastructure. Furthermore, this cooperation should make better use of personnel resources. This collaboration creates a central point of contact for approval and testing in all areas of rail transport, from the tram to the high-speed train.

Beuth Innovation Prize goes to Felix Kröger

At the annual general meeting of the DMG (German Mechanical Engineering Association) in Frankfurt in October 2015, the Beuth Innovation Prize was awarded to Felix Kröger from DB Systemtechnik. In his thesis entitled "Modelling and implementing the rail conditioning on a wheel slide protection test rig", he described the new challenges concerning the subject of brakes, in particular the tough demands made on brake systems for lightweight vehicles, primarily the multiple units in regional and local transport, which must operate safely and without restrictions in service when subject to extremely low adhesion, or even critical rail conditions.

In memory of Christian Peter Wilhelm Beuth (1781–1853), the DMG has been awarding the Beuth Medal since 1899 to individuals who have made a particular contribution to the development of rail transport and to the integration of technological innovations into rail transport.

New concrete sleeper test rig in Minden

In order to better assess the quality of concrete sleepers as well as any damage to them in the actual track, DB Systemtechnik, together with DB Track, has developed a new test rig at the Minden facility. This should enable the service life of concrete sleepers to be estimated with greater accuracy. A dynamic test was developed which simulates the passage of trains over a permanent way. In order to achieve this goal, a test programme was devised that enables a virtual train to be driven over the concrete sleepers so that the mechanical loading from a service life of decades can be verified within a few weeks. The test system consists of a ballast trough which realistically simulates the rigidity characteristics of the superstructure. Four concrete sleepers, two of which are connected with sections of rail, are then laid on this superstructure. The test force is applied by means of four hydraulic servo cylinders. In order to be able to measure and adjust the loads applied, the four sections of rail are equipped with sensors.

The actual examination takes place on concrete sleepers that have already been subjected to typical damage. This analysis examines which pattern of damage is generated or exacerbated by which train performance.

Photos: Hitachi Rail, DB Systemtechnik

Hitachi Rail Europe Intercity Express Programme (IEP) in the UK: test programme performed by DB Systemtechnik and ESG

Previously, DB Systemtechnik had tested the interaction between vehicles and the track by means of dynamic measurements, and verified that the pantographs interact faultlessly with the overhead lines by measuring the lifting and contact forces. In April 2016 the next phase began, comprising aerodynamics, pressure comfort and brake tests. DB Systemtechnik is being supported in this work by its British subsidiary company, ESG Rail in Derby. ESG has a test rig for wheel slide protection systems to supplement the brake tests on the route. In addition, ESG has developed a special adapter coupler in order to tow the new IEP units from Southampton Docks to the test track in Leicestershire.

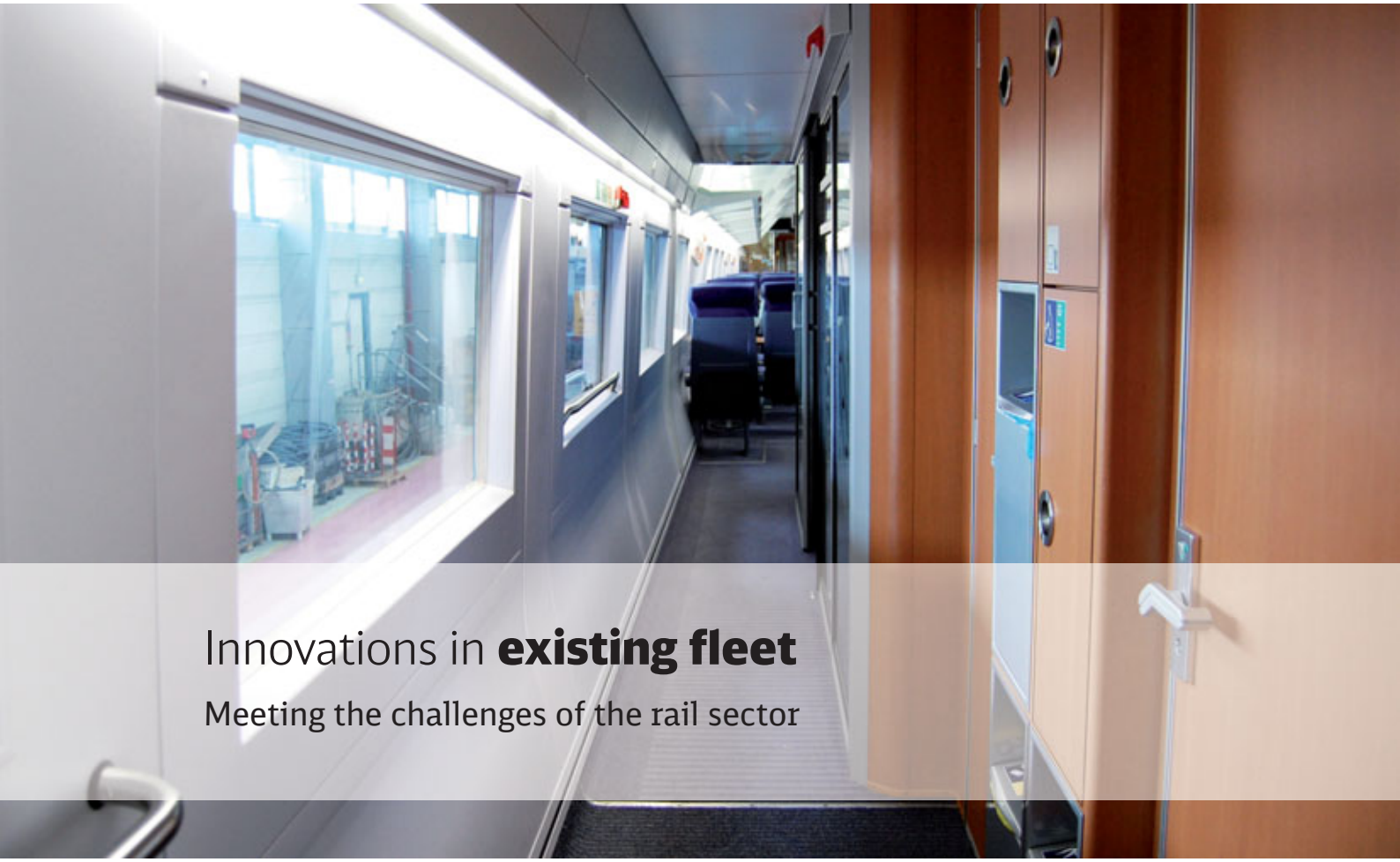
Tests for Danish infrastructure manager Banedanmark: speed record now stands at 235.8 km/h

On behalf of the Danish infrastructure manager Banedanmark, DB Systemtechnik has carried out acceptance runs for the overhead line on the Padborg – Malmö transit route. Two measurement pantographs checked the interaction of overhead line and the pantograph. In parallel with this, the vehicle's running characteristics and brakes were monitored. In the last week of March the measurement train operated by DB Systemtechnik attained a record speed on the Danish railway network of 235.8 km/h.

Our knowledge –

Your success

Photo: DB Systemtechnik



Innovations in **existing fleet**

Meeting the challenges of the rail sector

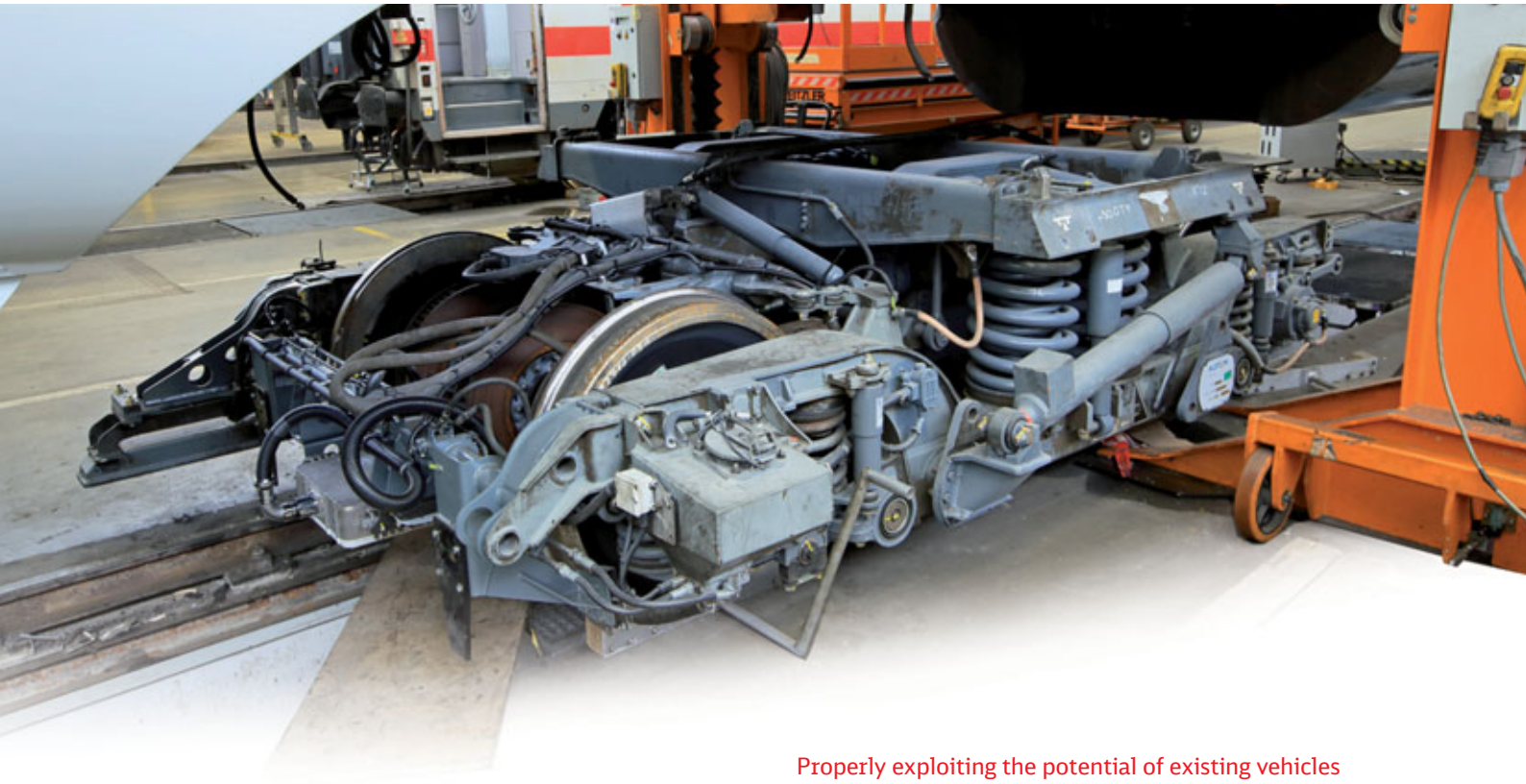
The prerequisite for sustainable growth in rail transport is customer satisfaction. Therefore, rail transport must focus on its historical strengths: safety, reliability, quality and eco-friendliness. And what is the situation as regards cost competitiveness? Is this not an essential factor?

Customer requirements are subject to change over time although vehicle fleets have a long service life. In order to impress our customers today, it is necessary to upgrade existing fleets and incorporate innovations in the existing vehicle fleet now. As a rule, innovations are implemented by means of components and subsystems that can be retrofitted in existing vehicles. The refurbishment of existing vehicles and sophisticated conversion projects show what possibilities already exist for impressing our customers with appealing and innovative vehicles.

Meeting customer requirements with vehicles capable of refurbishment and upgrading

The competitive pressure on the railways, however, already demands that the level of attractiveness is raised by implementing innovations in the existing fleets. Therefore, it makes sense to provide one or more refurbishment phases in the life cycle of the vehicle.

This demands a lot of the client bodies, especially in tendering processes for regional transport. It is not economically viable, on expiry of a contract period, to mothball entire fleets of vehicles that have not yet even reached one half of their technical service life and then order new vehicles. This is where the modernisation of existing vehicles is a cost-effective alternative. The expense involved in a refurbishment, in terms of development and production, is by no means insignificant. If conversions are to remain economical in future, despite continuously increasing system complexity of new vehicle generations and in view of the constantly changing requirements from the regulations, it makes sense that requirements regarding the refurbishment capability are already taken into account during the development of the new vehicle.



DB Systemtechnik has a wide range of experience with the conversion and modernisation of vehicles. From this, some basic requirements can be derived, in other words: requirements for vehicles capable of refurbishment:

1. The design must have sufficient reserves. Although a stability design with a 99% degree of utilisation may be evidence of the courage and confidence of the designer, it will not meet the needs of decades of service. To say nothing of the effects of regulations that change over time and of the further development of approval requirements that are to be taken into account in the event of subsequent modifications.

2. Vehicles are to be built on a modular basis; interfaces are to be documented and must not be proprietary. The background to this requirement is that retrofits of new functions or components are always to be integrated into the existing system as a whole. For this purpose, particularly when furnishing verification in the approval process, a detailed knowledge of the general conditions is required. Re-engineering of the entire vehicle is generally uneconomical.

3. Clear documentation is necessary, which is updated over the period of use. Especially in the field of vehicle software, a precise description of the individual functions and their interconnection is important in order that changes or functional expansions can be carried out at a later date.

Properly exploiting the potential of existing vehicles

Whereas present day refurbishment involves modernisation using reserves that are randomly available in the existing system or that must be created at additional cost, the aim in future is to predict certain technical and social developments and to integrate the necessary reserves into the vehicles during the development process.

The increased availability of the fleets overall and of their customer-relevant functions is prerequisite for meeting the basic requirements of our clients. The prerequisite for a sustainable effect of these quality-enhancing measures is to know the condition of the essential components and functions at any time and at any location. To this end, DB has developed solutions that can also be used on existing vehicles. By means of an on-board communications unit, condition data is collected from the train, pre-processed as required in an on-board data centre and then transmitted to a platform in a fixed location in order to connect applications in a protected computer centre. The preparation of data from vehicle and train components recorded in normal operation can be used for the purpose of condition assessment and for deriving any necessary measures for safeguarding availability.

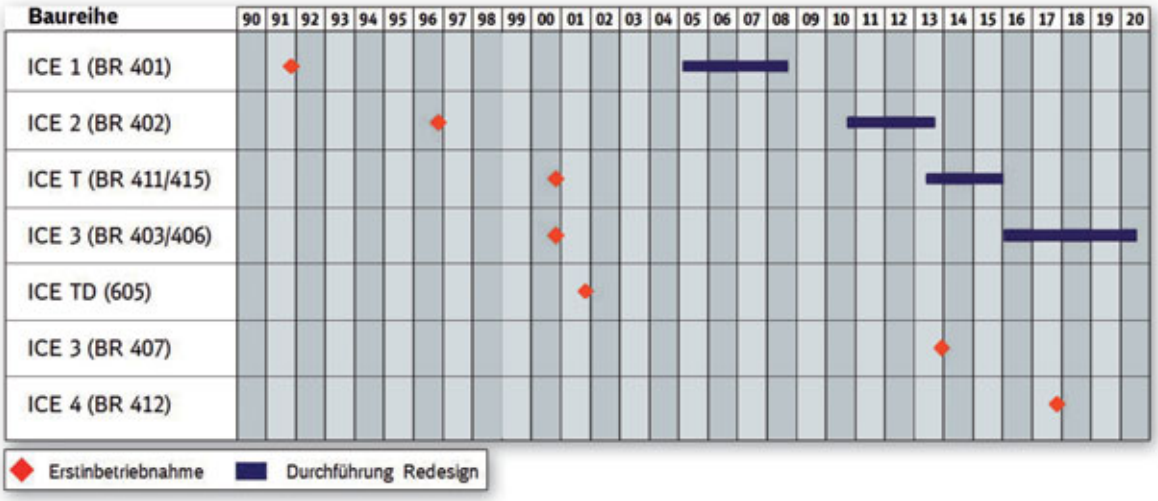
Photos: DB AG/Uwe Miethe, Manfred Dube, DB Systemtechnik

Further practical examples demonstrate the potential of existing fleets for modernisation and innovation. First, the example of a series of suburban trains (S-Bahn). As a rule, S-Bahn vehicles operate without train attendants, but, especially during quieter periods at each end of the day, passengers have an increased need for security. An open-plan, well-lit vehicle architecture which, above all, offers open access over the entire length of the multiple unit, ensures greater safety.

The three-car Class 474 multiple units operating on the Hamburg suburban transit system, purchased as of 1996 as a self-contained concept, do not meet these requirements. As part of comprehensive modernisation programme, therefore, the interior space is being refurbishted and a modern passenger information system is being installed. But can you create an open-access multiple unit from a three-car self-contained vehicle? Yes you can. Following delivery of the first converted vehicle in January 2016, 111 existing vehicles will be modernised by 2021.

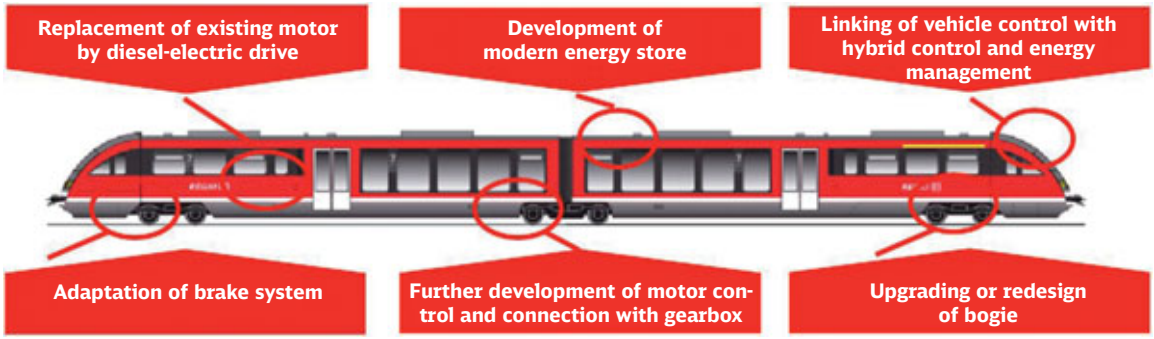
The refurbishment of the ICE fleets is another example of adapting the interior space of existing vehicles to contemporary design. After about 15 years of service, covering a mileage of at least 7 million kilometres, the vehicles are being given a technical upgrade and facelift. The refurbishment project is currently in progress for ICE 3, which will also be subjected to an upgrade starting from 2016. As well as modifications to the interior design, the installation of modern passenger information systems and the installation of WLAN, technical measures to increase the availability of rolling stock are also being implemented. Although the measures described above are to a great extent customer-relevant, they are not innovations in the real sense. As an example, a project that is geared towards sustainability and environmental compatibility demonstrates how the position of rail transport as the most environmentally acceptable means of transport can also be strengthened using existing vehicles.

Deutsche Bahn operates 234 Class 642 vehicles which are equipped with mechanical diesel drive and are due to have their drive systems modernised. This poses the question of whether the existing drives should be replaced by new power packs which, although they meet the latest emission limits, retain the conventional drive concept, or whether an innovative drive design could be implemented in this large number of vehicles.



It was decided that the basis for converting the series vehicles to a hybrid drive should be established in a publicly funded project. The aim of the conversion initially of just one prototype vehicle is a leap in development with regard to environmental compatibility for vehicles that operate in regional transport on non-electrified lines.

As the omission of seating capacity is not acceptable, conventional components such as wheelsets and bogie frames must also be refurbishmented and the suspension system adapted to the modified weight conditions. Approval of the converted vehicle therefore presents a particular challenge.



By hybridising the drive, consistent electrification of the auxiliary units and installation of an intelligent energy management system, the potential for energy recovery of a regional transport vehicle is used to save energy. In addition, the conventional air conditioning system is replaced by a CO_2 system with heat pump function. The diesel-mechanical drive concept with two power packs per multiple unit that has been in use until now has been left behind in favour of a diesel-electric concept with just one diesel engine.

The space previously occupied by the second power pack now accommodates lithium-ion batteries. By means of a generator, the diesel engine feeds the intermediate traction circuit that supplies the traction motors and all auxiliary consumers. In braking mode, traction motors are used as generators to recover energy. The external charging of the stabled vehicle is possible by means of a transformer installed on the roof.

The vehicle design is also being prepared for recharging from the traction network by means of a pantograph to be installed later. Of course, these fundamental changes to the series vehicle result in added weight, which cannot readily be compensated for without a loss of seating capacity elsewhere.

Consistent approval management accompanying the development process ensures that the assemblies to be installed meet functional safety and fire protection requirements.

The examples presented here are only part of the continuous programme of modernisation and conversion. They demonstrate, however, that the customer requirements to modern vehicle can also be covered by using existing fleets. Rail vehicles are expensive to purchase, but they also have a long service life. A shorter useful life and regular replacement of fleets after ten to 15 years would be uneconomical.

The aim of the railway sector must be to react quickly and, above all, demonstrably to the demands of customers, so that innovations can be widely experienced. To do so, existing fleets must regularly be adapted to the latest requirements and standards in terms of quality, innovation and technology. Deutsche Bahn, like DB Systemtechnik, shows that targets can be achieved by a suitable mix of new purchases and fleet modernisation, so that customers continue to experience the potential of rail transport on a daily basis:

environmentally compatible, attractive and innovative.

Photo: DB AG/Kai Michael Neuhold

ICE 4:
Four trains at once

ICE 4: Four trains at once

"Done!" Jörg Neugebauer, project manager at DB Systemtechnik, breathed a sigh of relief. In July 2016 the job was done.

After ten months and several hundred test runs since September 2015, Jörg Neugebauer was able to notify the steering committee of the ICE 4 project of the completion of the vehicle tests. All trial runs (test and inspection runs) for the approval of the ICE 4 were concluded in June and further tests not relevant to the approval (within the scope of the examintation of requirements specification and customer requirements) ended in July 2016. The overall project, however, had already begun in the autumn of 2014. Countless preliminary discussions with Siemens, the manufacturer of the trains, were necessary before the first official 65-page offer could be submitted in February 2015.

DB Systemtechnik was tasked with performing the "high-speed test runs" and approval runs for the following technical disciplines:

- Vehicle dynamics tests (static and dynamic tests)
- Brake system tests
- Measurements regarding drive behaviour, traction
- Measurements regarding the interaction between pantograph and overhead line
- Acoustic measurements
- Aerodynamic measurements
- Air conditioning measurements and dynamic pressure tightness
- Measurements relating to train protection systems

In addition, preliminary tests were also commissioned for brake and the pantograph on the rail testing circuit in Velim (Czech Republic) and preliminary tests on the lines of the German rail network. Irrespective of the above-mentioned technical disciplines, DB Systemtechnik was also tasked overall as a railway undertaking (RU), and thus

carried out all further runs, including transfers and journeys to the maintenance workshops. To perform the aforementioned activities, a total of seven ICE 4 test trains were used, sometimes with four multiple units being tested in parallel on the German rail network. Jörg Neugebauer, as project coordinator, was responsible for the overall project. For the project, this meant one central point of contact for all issues relating to test runs and the task of coordinating all relevant interfaces.

Thanks to his many years of experience with major projects of this type and the excellent links to all parties involved in the project, whether within DB Systemtechnik to the functional departments or to the interfaces of DB Infrastucture, it was possible to create an "all-inclusive package for complete peace of mind" for the client. In consideration of these general conditions and the specified schedule Jörg Neugebauer, together with the test departments and DB Systemtechnik job schedulers at the locations in Minden and Munich, set about the task of creating the schedule and project plans for the individual technical disciplines to be tested and applying for the timetables. All drivers at DB Systemtechnik were trained in advance on the ICE4 to enable them to perform the test runs. Four months before the first test run, the application for test runs was submitted to the EBA and DB Netz AG.

The first coach arrived as early as December 2014 in Minden, where stationary tests were performed relating to safety against derailing on twisted tracks on the twist test rig and on the curved test track. In total, four individual coaches were then tested in March 2015.

Climatic and function tests on the ICE 4 driving trailer

MEikE

For fundamental assurance of the climatic conditions for the driver's cab, to confirm theoretical assumptions in advance, and to minimise risks and avoid repeat tests at RTA Vienna, climate trials and function tests were carried out in the MEikE climatic chamber operated by DB Systemtechnik at Minden.

In addition to the tests relevant to the standard for checking climatic comfort in the cab (EN 14813), the climatic and function tests included function tests of the air-conditioning unit and of the vehicle components (door, windscreen wipers, etc.) performed under extreme winter and summer weather conditions, including simulated torrential rain, snow and sleet. In addition, the heat transfer coefficient of the driver's cab was determined by means of a k-value measurement. In this way, a comprehensive range of climatic tests was covered.

Photos: DB Systemtechnik

The next "physical" contact with the new train was then by the HVAC department at DB Systemtechnik. Using the end coach of the ICE 4, manufactured by Bombardier Transportation, climatic trials and function tests were performed in the MEikE climatic chamber at the DB Systemtechnik facility in Minden.

Things then really got moving at the end of September 2015. The first multiple unit, a 12-car train, arrived in Minden and – as part of the "high-speed test runs" – undertook test runs on relevant routes, including the high-speed lines of Deutsche Bahn, to obtain declarations of non-objection for the vehicle dynamics, pantograph, brake and EMC/interference current systems. From October onwards, test runs were occasionally performed with 4 multiple units.

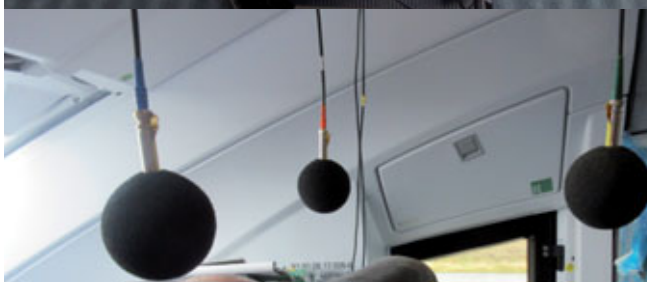
The vehicle dynamics tests were carried out in accordance with DIN EN 14363, three different types of coach being examined, specifically one middle coach with powered bogies, and one intermediate and one end coach with trailer bogies. Twelve instrumented wheelsets (powered bogie and trailer bogie), which were manufactured in the instrumented wheelset laboratory in Minden, were used.

The brake tests were conducted on the basis of the EBA testing module for traction units, the relevant UIC leaflets for the brake and the Rolling Stock TSI. The following areas were tested:

- Brake system monitoring for high speed test runs
- Brake equipment at a standstill
- Braking capacity
- Wheel slide protection function
- PEAB/EBO/PAS
- Testing of system failures
- Diagnostics and brake test.

The dynamic interaction between the pantograph and the overhead line was examined in accordance with the TSI requirements Rolling Stock TSI/Energy TSI, EN 50317 and EN 50367. The average overall contact force, the arrangement and the lowering of the pantographs were checked in these tests. In addition, uplift measurements at overhead line masts took place, and the quality of current collection was determined by means of contact force measurements. For the approval of the train in Germany, the height of pantographs also had to be checked in accordance with national requirements.

Photos: DB Systemtechnik



The acoustic measurements took place in accordance with HS RST TSI. In addition, acoustic verification was provided in accordance with the regulations for occupational health, safety and special customer requirements. The measurements of the pass-by run and in the driver's cab during the run were performed on the Stendal-Wolfsburg section of the Hanover – Berlin high-speed line. The measurements during starting, of the signal horns and the stationary measurements were performed on the Siemens test circuit at the Wildenrath test centre (PCW).

The aerodynamic measurements in compliance with the Technical Specification for Interoperability relating to the 'rolling stock' sub-system were carried out on a straight section of track with ballast bed. Three calibrated ultrasonic anemometers were used for this. Proofs of conformity were produced on the topics of flow loads on track workers and passengers, pressure loads in the open air, and maximum pressure variations in tunnels.

The "performance measurements" included proof of the traction parameter requirements and compliance with the power factor and were carried out on the test circuit at the Wildenrath test centre and on the routes of DB Track. Starts on a maximum incline (simulated by a brake vehicle) in the event of a failure of a drive module were also tested, as was the power supply and the energy recovery or the minimum accelerations and maximum commercial speed. In addition, "warm-up runs" were carried out as part the examination of tender specifications requirements.

ICE 4

Photos: DB Systemtechnik

This meant that, over the course of the months, all of the technical disciplines that had been ordered and that were relevant to approval were successfully completed by DB Systemtechnik – but not only the services originally ordered in the basic agreement: since then further tests in order to meet the requirements of the specification has also been commissioned as well as tests for the approval procedure.

The greatest challenges was the mastery of short-term deviations of tests due to vehicle or infrastructure effects. This not only meant that prearranged handovers had to be postposed, but also that tests already planned in detail had to be reorganized.

The challenges in these cases were always the same: to reorganise the test teams, to block off longer periods and also ensure the availability of drivers. Such measures were also necessary if the test runs had to be repeated on a daily basis, or if disruptions of an operational nature occurred (line closures, speed restrictions or short technical disruptions on the vehicle itself).

"We were almost driven to despair sometimes" continues Neugebauer, "if the vehicle did not behave as we wanted it to. But we always managed to adjust the schedules and agree them with the customer in such a way that the postponements never had an impact on the overall project timetable. We also received repeated recognition for this flexibility and excellent performance in the steering committee of the overall project."

DB Systemtechnik was therefore able to impressively demonstrate its unique level of expertise in the field of vehicle approval in this project, the largest undertaken for many years. It should also be noted that trials and test runs were being conducted in other projects at the same time, both in Germany and abroad.

The ICE 4 evacuation exercise took place at DB Systemtechnik in Munich on 9 April 2016. This test is necessary to ensure that the train obtains its approval and stipulates that 300 people must be able to leave the train within three minutes. The volunteer "passengers" were then rewarded for their efforts with hot drinks in the machine hall.

ICE 4: Depot planning

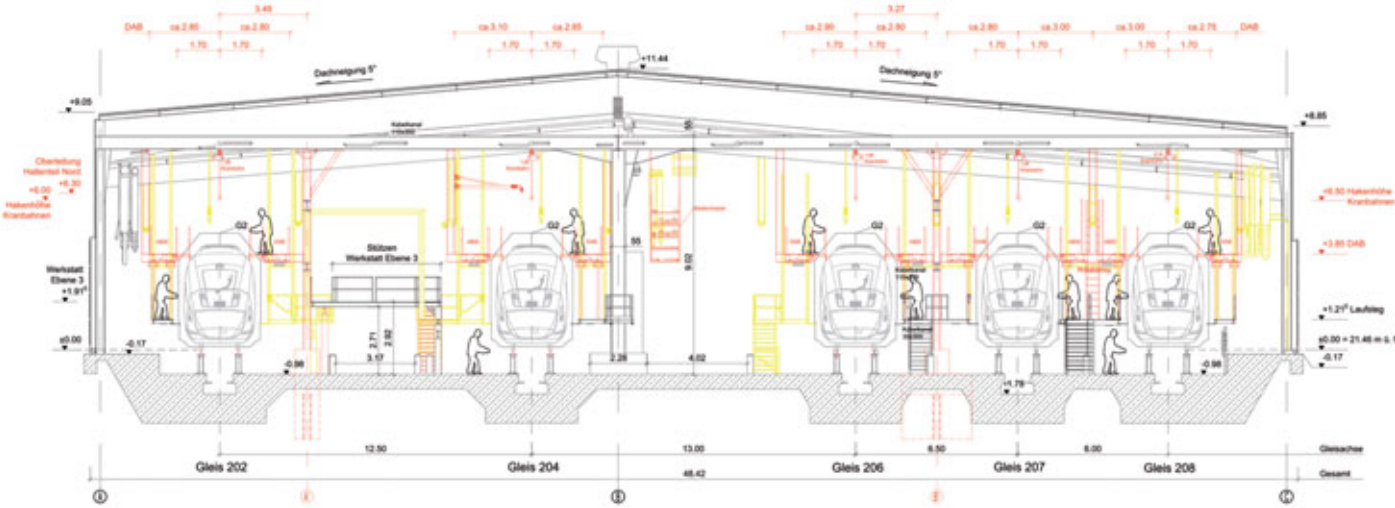
The ICE 4 sets new standards for the customer – and for the DB Long Distance depots!

Just as the vehicle fleet will change in its appearance over the years to come, the depots will also have to develop: away from the maintenance of locomotive-hauled passenger coaches and towards maintenance during scheduled out-of-service periods for multiple-units on four levels, ranging from manufacturing level to light overhaul.

This calls for extensive adaptations to conventional passenger coach depots, but also modifications to existing ICE depots. The tasks to be undertaken by DB Systemtechnik started with an analysis of the preliminary vehicle design and the resulting drafting of a prototype track as a requirement template for the local, individual infrastructure projects in the seven future ICE 4 depots. The evaluation of the maintenance documentation thus formed the basis for discovering efficient technological solutions for workshop production.

Trial removals of replacement components were initiated and supported to ensure feasibility. The applicability of the extensive range of special tools was also checked and, where necessary, these were subjected to further development. It was possible to identify critical issues from the perspective of the maintenance depots, such as the machining of wheelsets with inboard bearings on the existing underfloor lathes and solve them in collaboration with the vehicle project.

In the new facility being constructed in the Nippes district of Cologne, the prototype track can, to a great extent, be implemented without restrictions. As a subcontractor to the principal planning contractor, DB Engineering & Consulting, DB Systemtechnik designed the extensive mechanical systems here that are required for handling the vehicles. The depot will start operations at the end of 2017.



Focal points for infrastructure modifications in the existing depots are

- Upgrading the crane system for replacing roof-mounted HVAC systems to 1.5 metric tons
- Adaptation of wheelset replacement stations to the distance between bogie pivots of the 28 m long vehicle bodies
- Adaptation of the connection points for supply and disposal systems
- Installation or adaptation of train-length roof working platforms with safety barriers
- Installation of pivoting overhead line sections, adaptation of the switching sections
- Establishing the prerequisites for conducting non-destructive tests on axle shafts and discs
- Ensuring adequate working room at the side and logistics for component replacement
- Expanding the capacity of spare parts storage

For the ICE depot in Munich the workshop designers at DB Systemtechnik drew up the necessary changes to the production system for creating multifunctional work stations, on which all four generations of ICE can be handled with equal efficiency. The work included the necessary adjustments to the machinery, the required expansion of the storage facilities and the construction, jointly with DB E & C, of a new shed for the underfloor machining of wheelsets. The conversion work will be completed in December 2017 in time for the start of passenger service with the ICE 4 trains.

For the Hamburg-Eidelstedt facility, plans and documents for the invitation to tender were drawn up for the upgrading of two tracks for ICE 4 trains. In each case these are the outer tracks in the shed which are already equipped with end-to-end roof working platforms suspended from the shed walls. Following the invitation to tender and award of contract, conversion and commissioning will take place at the 2017 timetable changeover.

As a leading maintenance depot for the ICE 4, the Hamburg-Langenfelde depot (see diagram below) is of key importance in the nationwide network of depots.

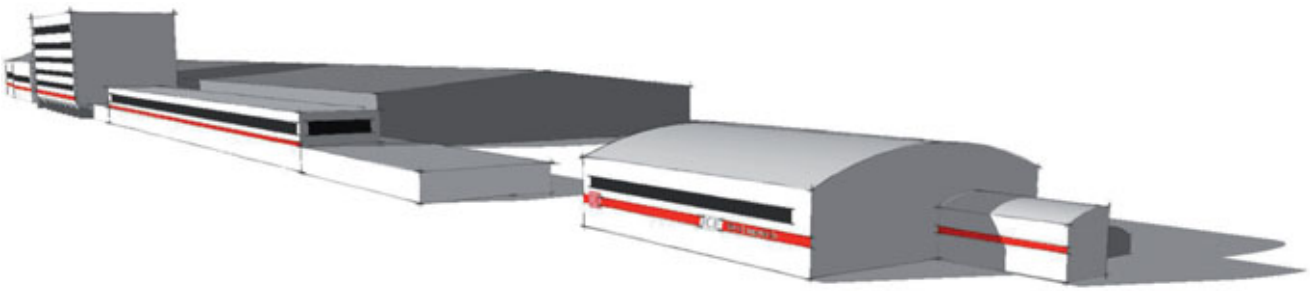
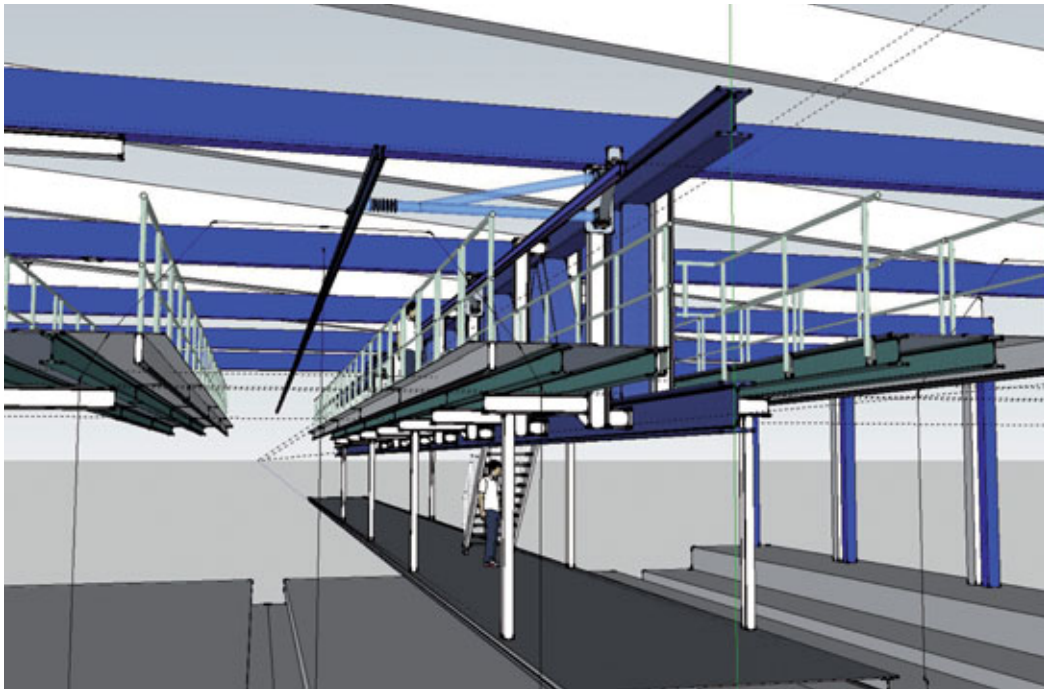


Illustration: DB Systemtechnik



On the basis of a comprehensive feasibility study prepared by DB Systemtechnik, DB Long Distance decided in 2015 to convert the former passenger coach depot and commissioned the basic evaluation and preliminary planning of the project.

The maintenance depot designers in Kirchmöser took charge of the planning work for the following essential sub-tasks:

- Adaptation of the work stations and installation of additional equipment in the vehicle shed covering an area of approx. 22,000 m²
- Removal of an integrated office section to make room for roof working platforms and crane systems in the vehicle shed
- Conversion and raising of the auxiliary workshop building
- Construction of a new warehouse
- Adaptation of the track layout and traffic routes in the outdoor area
- Construction of a multipurpose shed with two individual workstations for replacement of large components

The workstation on the west side of the multipurpose shed represents an innovation: positioned between two platform bogie exchangers it will have three independent, hydraulically lowered track segments.

These enable heavy underfloor assemblies such as transformers or converters to be lowered and removed for efficient replacement. The parallel operations on three levels of the workstation enable the phased overhaul of a 12-car ICE 4 within 12 days, without occupying one of the period-inspection tracks in the large vehicle shed.

DB Systemtechnik is responsible for the mechanical engineering in the project as well as the system planning. This includes the development of an overall production concept established for the depot and its translation into coordinated functions of the workstations, their equipment and logistics. The project was planned in close cooperation with the northern planning office of DB Engineering & Consulting, which assumed overall responsibility in the structural engineering phases following final design.

The project makes significant demands on all parties involved. These include not only the tight timeframe for planning and implementation but also the high utilization of floor area in the existing building and devising the construction phases to be coordinated with the ongoing depot operations as well as their transition and intermediate states. The HOAI phases 1-4 of the complex conversion project were completed in the comparatively short period of less than two years. The first sub-complexes will enter service in 2018.

Expertise, products **and Sales**

The technical expertise of **DB Systemtechnik**

Infrastructure

- Battery technology
- Lubricants, oils
- Maintenance shops
- Maintenance technology
- Materials science
- Passenger information systems
- Systems engineering

Vehicles

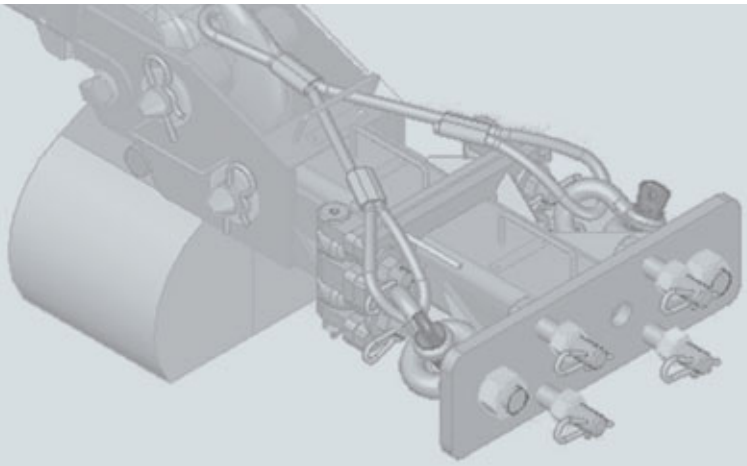
General vehicle
- ICE
- IC
- Locomotives
- DMU, EMU
- Freight wagons
- Passenger coaches

Module, component, part
- Battery technology
- Bogies
- Brake technology
- Buffing and draw gear
- Coating systems and corrosion protection
- Coupler
- Data bus systems (train bus) for passenger traffic
- Energy supply
- Fatigue strength
- Fire protection
- Glue assembly
- Heating, ventilation and air-conditioning
- Lubricants, oils
- Materials engineering
- On-board electrical systems
- Pantograph
- Passenger information systems
- Running technology
- Tilting technology
- Traction technology
- Vehicle software
- Welding technology
- Wheelsets

Interfaces

- Acoustics and vibrations
- Aerodynamics
- Electromagnetic compatibility
- Electromagnetic fields (EMF)
- Interaction pantograph/catenary
- Safety
- Telecommunication
- Transmission systems
- Vehicle-track interaction

Know-how



The products of
DB Systemtechnik

Engineering

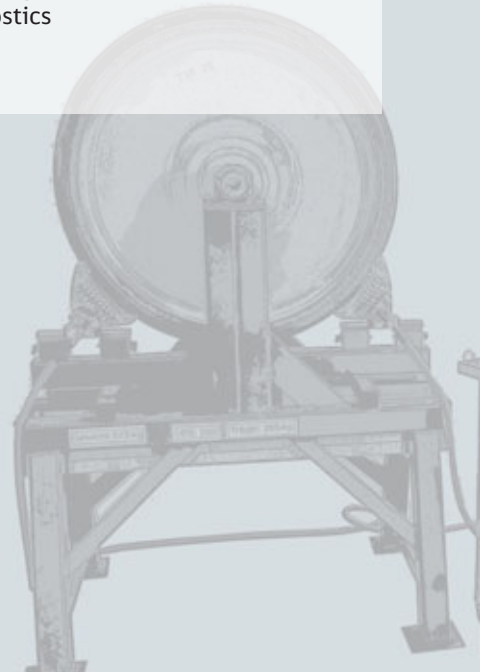
This product segment includes engineering design solutions for type modifications to rail vehicles, re-design work, accident repair and the refurbishment of rail vehicles, taking into account system interactions with the environment (e.g. aerodynamics, acoustics, EMC) and with the railway infrastructure (e.g. control and command technology).

Engineering design

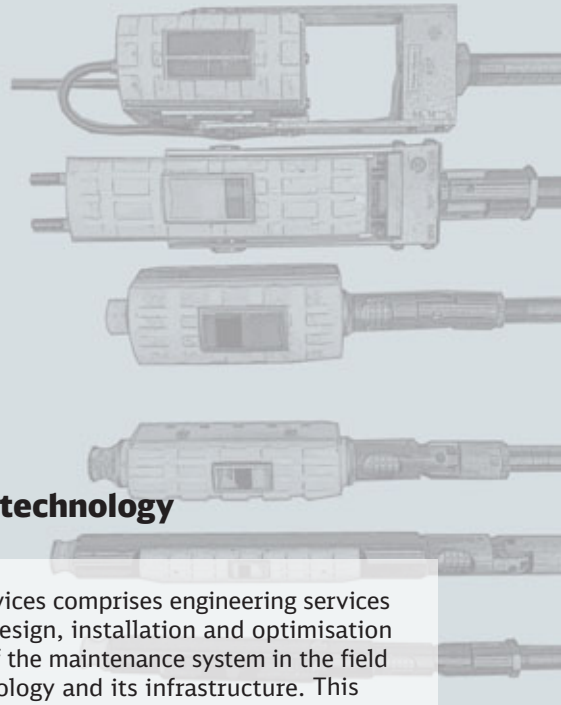
- Engineering design support for new vehicles
- Refurbishment of existing vehicles
- Engineering design for components/ type modifications
- Accident and damage analyses
- Damage and accident repair

Engineering

- Type support
- Service of assets
- Fleet management
- Procurement support
- Supplier/product qualification
- Carrying out studies
- Rules & regulations and committees
- Obsolescence management
- IT usage & diagnostics
- Software



Photos: DB Systemtechnik



Testing an approvals services

Measurement, testing, evaluation and assessment: for full substantiation of quality and safety. A task that requires comprehensive knowledge of systems, suitable test methods and tools, along with well-founded technical trial expertise.

Testing
- Vehicles
- Infrastructure
- Components
- Expert assessment

Approval
- Approval of vehicles
- Approval management
- Expert assessors
- TSI certifications (NoBo)
- AsBo/DeBo
- Partial approvals for infrastructure

Measurement technology
- Measurement and diagnostic systems

Mantainance technology

The range of services comprises engineering services for conceptual design, installation and optimisation of all elements of the maintenance system in the field of railway technology and its infrastructure. This also includes the conceptual design, implementation support and introduction of test and diagnostics systems, as well as automated condition monitoring systems – including the associated IT solutions with functional operations management.

Maintenance systems
- Development and support of maintenance concepts
- Depot planning and intralogistics
- Testing services and maintenance procedures
- Testing and diagnostics equipment
- Metrology/calibration systems
- Non-destructive testing
- Materials engineering
- Welding and adhesive bonding

Photos: DB Systemtechnik, ESG

Management

Hans Peter Lang
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Christoph Kirschinger
General Manager Sales

Business lines

Head of the business line Engineering
Nils Dube

Head of the business line Testing Services
Dr. Lars Müller

Head of the business line Maintenance
Dr. Burkhard Schulte-Werning

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Josef Rixner

Sales in the United Kingdom
Paul Forrest

Sales in the United Kingdom
Nick Goodhand

Sales in France, Luxembourg, Belgium and Norway
Jérome Robin

Sales in Asia and Eastern Europe
Sergel Smajatin

Head of Marketing and Sales Support
Alfred Hechenberger

References **2015/2016**

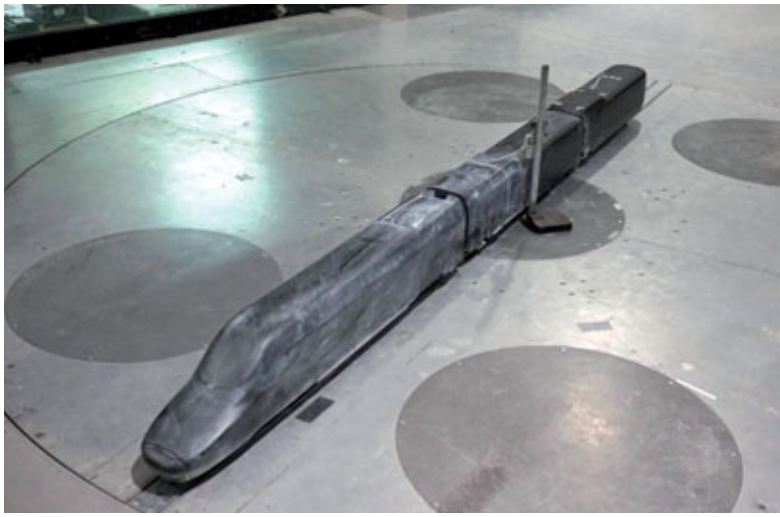
Talgo wind tunnel trials
for major Haramain project

As part of the Haramain major infrastructure project in Saudi Arabia, the obligations of train supplier Talgo include TSI-compliant wind tunnel tests to provide proof of crosswind stability of the high speed trains.

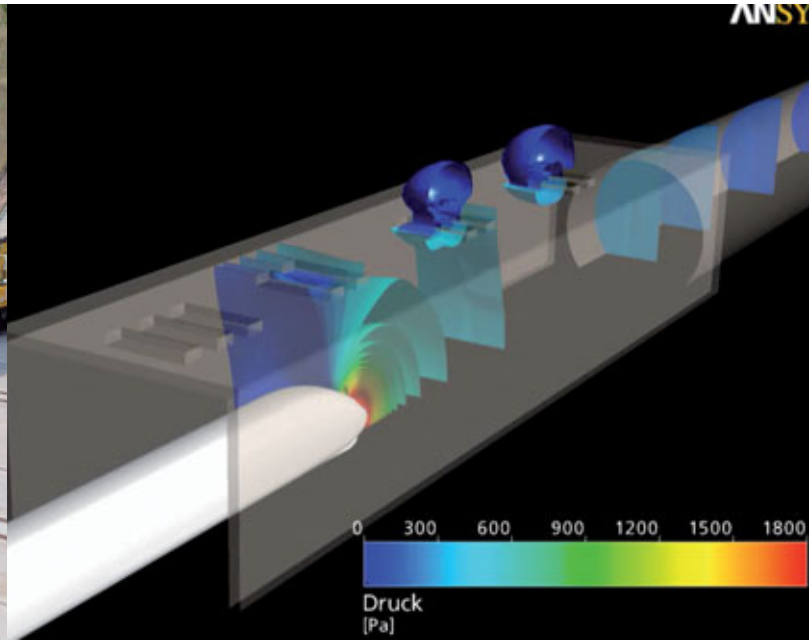
It had not been possible to furnish this proof in the "simplified" wind tunnel tests already performed in 2014. The repeat measurements in 2015 included a detailed model configuration. To protect the customer's interests, implementation of the wind tunnel tests now had to be monitored by specialists to ensure compliance with the contract.

In this project, the aerodynamics test laboratory of DB Systemtechnik is providing specialist consulting services in the quality assurance of contractually agreed manufacturer duties on behalf of DB Engineering & Consulting. To this end, the test specification of the manufacturer was evaluated and commented on to ensure conformity with the TSI requirements. During the wind tunnel tests, which were performed in France, all non-conformances and limitations of the wind tunnel were recorded. This quality-assuring on-site support enabled all irregularities associated with project risk to be discussed at short notice in conference calls with the Haramain project management.

After any technical problems had been rectified by the wind tunnel operators, they went on to perform all necessary measurements within the scope of their possibilities and compliant with regulations. On the basis of the early status reports, the project management was able to minimise further risks in the overall processing. In particular, these reports provided information on deviations from the contractual agreements with regard to further considerations of crosswind stability; these are to be considered in the further course of the project.



Photos: DB Systemtechnik



Micro-pressure waves at tunnel portals:
national regulations and international standardisation

Under certain conditions, the passage of trains through long railway tunnels gives rise to an unpleasant phenomenon of tunnel aerodynamics: the emission of audible micro-pressure waves (MPW) at the tunnel portals. Following the micro-pressure wave incidents ("tunnel boom") on the Nuremberg–Ingolstadt new-build line in 2005 and 2006, the following procedures have been implemented in parallel at DB in recent years, under the guidance of DB Systemtechnik:

- New forecasting and evaluation procedures have been developed
- Corresponding regulations have been drawn up with the assistance of the German Federal Environmental Agency (UBA) and the Federal Railway Authority (EBA)
- All tunnel construction projects on new-build lines in progress have been correspondingly re-evaluated
- Corresponding countermeasures have been designed for various tunnels on the new Erfurt–Halle/Leipzig Ebensfeld–Erfurt lines and Ulm–Wendlingen lines and incorporated into planning procedures

In the autumn of 2014 the first trial runs took place on the now completed Erfurt-Halle/Leipzig new-build line. The test data is to be used, among other things, to reinforce the existing MPW forecast and evaluation procedure. To this end, on behalf of the DB Innovation Management, the VDE-8.2 test data was analysed in greater depth, compared with forecasts obtained from numerical simulations and, in some cases, used for further development of the tools.

Further safeguarding of the DB forecast and evaluation approaches was achieved by the benchmarking of our tools against those of the Japanese Railway Technical Research Institute (RTRI), which was performed as a result of a cooperation between DB Systemtechnik and RTRI. In this context, the RTRI sent a scientist to work with the MPW experts at DB Systemtechnik in Munich for one year. The results attained within the project substantiate the content-related and functional correctness of the existing procedure recorded in the DB Regulations. The project results were presented to the scientific community in September 2015 at a technical symposium in Munich, jointly staged by DB Systemtechnik and RTRI. The project results were so well received in the technical community that it was possible to incorporate the key aspects of the German MPW regulation approach in the draft of the EN 14067-5 standard, which is currently being revised.

Overall, the project serves the following purposes:

- Minimising the risks for further new-build line projects equipped with numerous MPW measures
- Further increasing the quality and economy of furnishing proof in connection with MPW
- Pan-European safeguarding of the vehicle/track system interface now defined in Germany

New passenger information
in the Cologne diesel network

With regard to passenger information, the requirements of the client bodies in regional transport today usually include the display and announcement of live information regarding punctuality and connecting services. The provision of this information to the vehicles is guaranteed by using the traveller information system operated by DB. This real-time information is guaranteed by a mobile telephone connection between the train and a central traveller information system.

When new rolling stock of the 620/622 classes was being put into service in the Cologne diesel network, DB Systemtechnik was commissioned by the vehicle purchasing department of Deutsche Bahn to check the new systems. To verify proper functioning, corresponding tests were conducted at our IT test laboratory at DB Systemtechnik in Munich in collaboration with colleagues who are responsible for the background system.

On successful completion of this laboratory test, preparations were made for testing (type test of the traveller information system and line acceptance) on the lines of the Cologne diesel network by DB Systemtechnik staff. The punctuality of the train and possible connecting services are now displayed to the passengers on monitors in the door areas.

Inspection of the test systems
on the MÁV rail inspection trains

Monitoring of the infrastructure is increasingly being performed by inspection trains with ultrasonic testing and eddy-current testing equipment. In this way, such safety-related inspection of the rails can increase operational reliability on railway routes and optimise maintenance. The number of railway undertakings in various countries that only accept such ultrasonic and eddy current inspection results from suppliers of inspection trains is continuing to rise.

The Hungarian MÁV company has two such inspection trains that are used not only in Hungary but also in neighbouring countries. Annual inspections of inspection facilities give clients the reassurance that the inspection system is always up to date and fully functional. The annual verification of conformity gives MÁV Kft. greater opportunities for acquiring inspection orders on the international market. MÁV lacked the experience and equipment for determining the conformity of ultrasonic and eddy current inspection systems.

The experts in non-destructive testing at DB Systemtechnik have therefore been performing annually recurring inspections of the test systems on the MÁV inspection trains since 2013. To this end, with the support of colleagues from Kirchmöser, two reference tracks with built-in faults corresponding to DB Guideline 821.2007 were completed in 2013 and 2014. Since then, the annual inspections have been carried out on these lines. This means that DB Systemtechnik can carry out the inspection in Hungary near Budapest, and the inspection trains do not have to be transferred to Germany.

Photos: DB Systemtechnik

Humming noise
at the driver's workplace

An extremely annoying humming noise caused by an isolating transformer in the driver's cab of individual new vehicles for regional transport ultimately resulted in engine drivers refusing to operate these vehicles. The suspicion was expressed that long-term exposure to this noise could be damaging to the driver's health. The affected vehicles were taken out of service until the matter could be clarified. These downtimes put a strain on the operator.

So it was necessary to determine as quickly as possible by means of objective measurements whether a real health hazard existed. The acoustics and vibration testing laboratory at DB Systemtechnik therefore performed local acoustic measurements in various cabs under actual operating conditions and compared the results with the applicable guidelines. On the one hand, the absolute noise rating levels were determined in order to identify any possible risk potential while, on the other hand, a direct comparison was made between one driver's cab regarded as having no conspicuous noise and one that was acoustically noticeable in order to demonstrate that the problem relates to a defect in the vehicles in which noise was noticed.

The result indicated a clearly increased noise level of up to 9 dB (A) in the driver's cab with noticeable acoustic problems, caused solely by the humming noise. The lower threshold for an incipient health hazard was, however, not exceeded. The final test report included information on the possible effects of the humming noise on the train drivers, such as impairments to their perception, concentration and reactions in order to give the client grounds for bringing claims against the vehicle manufacturer.

New suppliers for
brake pad holders

Until 2010 there were only two companies supplying brake pad holders to Deutsche Bahn. The objective was the qualification of new suppliers to achieve greater competition and thus lower prices of spare parts and greater security of supply. The experts in the specialist brake systems department of DB Systemtechnik worked on this project in a cross-functional team together with the parts purchasing department of Deutsche Bahn and the transport departments.

In an initial stage the necessary specifications were prepared for the invitation to tender. Specifications for type tests were then drawn up and checked for their content. The documentation for the invitation to tender was evaluated together with the purchasing department. Trial installations in the vehicles were initiated with selected companies, thus marking the start of preparation of the wider introduction of new products.

By introducing new products over a wide area and creating more competition, it was possible to procure these products in the 2015 invitation to tender for less than 50% of the earlier price level.

The objective formulated in 2010 was thus fully achieved and now four suppliers are available with qualified products.

Determining external air intake volume **on a driver's cab**

In order to keep the CO_2 content in a driver's cab to within the limits applicable for Europe, it is necessary to supply a fresh-air/external air intake of at least 30 m³/h per person. The usual test methods for determining external airflow volume are only applicable with a stationary vehicle, a condition under which the aerodynamic influences and leaks of the driver's cab that occur when running cannot be quantified. The Bombardier company tasked DB Systemtechnik with determining the external air intake volume on a driver's cab of the B13 double-decker driving trailer, specifically under realistic running conditions. The accredited test procedures applied in this case, known as the indicator measurement procedure/tracer gas measurement, were able to meet the customer requirements in full and, at running speeds of 80 km/h, 160 km/h and 176 km/h, to determine the external airflow with relatively low measurement costs.

The test method applied is based on the introduction of a constant volume of CO_2 via the intake to the driver's cab. The difference between the CO_2 content found in the cab and the CO_2 content of the fresh air is considered in relation to the introduced quantity of CO_2 and results in the quantity of external air. As a result, measurements are possible that take into account the real flow conditions during operation.

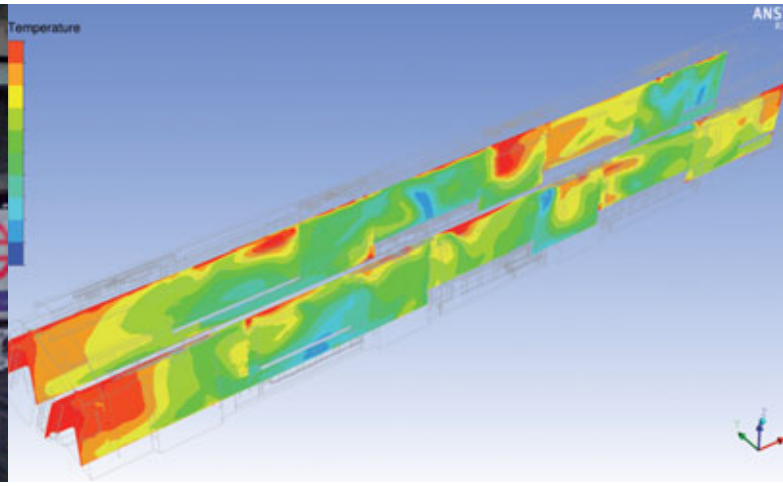
Alternative suppliers for gas spring systems **in ICE-3 bogies**

The aim of this project was the qualification of a further manufacturer of gas spring systems for the ICE Class 403. DB Long Distance wanted a supplier who already provides comparable gas spring systems for other running gear to be qualified for the ICE 3. The running gear department of DB Systemtechnik was commissioned with the technical support of this qualification.

This includes defining the requirements for the gas spring system, monitoring compliance with these requirements in laboratory tests at the manufacturer's factory, supporting a service trial with two multiple units with six-monthly expert assessment of the air spring bellows in their installed state and the final assessment that should result in an approval of the components across the whole fleet of ICE 3 Class 403 trains.

Following successful completion of the laboratory tests, service trials commenced at the end of 2015 with two ICE-3 multiple units, in which all bogies were equipped with the alternative gas spring systems. The first expert review on one of the trains after six months in operational use revealed that no abnormalities were detected either on the air bellows or at the well-known sensitive points in the area of the upper clamping mechanism. The field trial will continue to the end of 2016, when it is anticipated that the supplier will be qualified.

Photos: DB Systemtechnik



HVAC consultation
for the Delhi Metro

The Korean company Hyundai Rotem has been supplying metro vehicles to India for the Delhi Metro Rail Corporation for a considerable time now. The existing RS3 vehicle was the subject of a massive numbers of customer complaints with regard to the air quality in vehicles. Delhi Metro Rail Corporation therefore insisted on measures for improving the air quality in the RS 3 and for the prompt definition of measures to minimise risks for the follow-on RS 10 project.

Hyundai Rotem then commissioned DB Systemtechnik to advise on air conditioning for the customer in Delhi. The specialists supported Hyundai Rotem staff on site in India with their HVAC expertise in the evaluation of the air quality in the RS3 and during the determination of possible causes for the excessive carbon dioxide levels. Possible solutions were jointly discussed and presented to the Delhi Metro. Thanks to this on-site presence in Delhi, the requirements of the operator could be adopted quickly and directly, and proposed solutions immediately discussed and agreed upon.

This permitted a swift definition and evaluation of the measures and solutions that were presented. To evaluate the above-mentioned measures for minimising risks in the RS10 project, further CFD simulations (Computational Fluid Dynamics) were carried out by the aerodynamics department. This was to verify the functional capability of the ventilation system for the passenger compartment of the RS10 coach by means of simulation. In addition, the passive cooling of electrical components in the path of the exhaust air was to be evaluated.

In advance of the actual CFD investigation, an expert evaluation of the air flow was performed on the basis of the design data supplied and potential identified for improvement. This was implemented in part by Hyundai Rotem. The aerodynamic engineers at DB Systemtechnik then generated a detailed 3-D model of the RS10 coach from the design data.

The thermal simulations carried out enabled the functionality of the concept to be confirmed. By making a comparison with HVAC measurements taken by the DB Systemtechnik experts at the manufacturer's facility in Korea, it was also possible to improve the accuracy of the result. Thanks to the simulation results, Hyundai Rotem was able to show its client that the system works correctly and deliver the vehicle as planned. With the aid of the CFD, flow-optimised geometric adaptations could be implemented for some components. Critical zones could be identified for electrical components in the exhaust air path and countermeasures taken by the manufacturer. Simple statements concerning the leakages could also be derived from the CFD. The expert collaboration between various disciplines within DB Systemtechnik enabled quick and competent assessment of the proposed solutions from both an aerodynamic and an HVAC viewpoint.

In the meantime, the problems that occurred in the existing vehicles have been solved with lasting effect and the first new vehicles have been delivered to the customer.

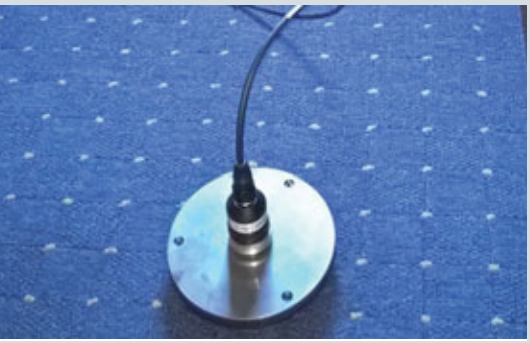
Beet-harvester on the **strength test bed**

A test object of quite an unusual kind paid a visit to the experts in fatigue strength at Minden in the spring this year. The object in question was a Maxtron 620 II agricultural machine main frame with an attached digger unit for a self-propelled beet harvester made by Grimme GmbH & Co. KG. The objective of testing the Maxtron mainframe was to obtain a statement on the effectiveness of constructive conversion measures carried out with regard to the expected overall service life. To this end, the trial was split into two sections:

- Static load testing: introduction of different power combinations to check the stresses on the overall structure
- Dynamic loading of the frame (geometry status 2016): output of sine-wave signals up to the planned number of 200,000 load cycles

These tests were carried out under laboratory conditions and at room temperature during the period from 23 May to 29 June 2016 on a universal test rig in Minden. On completion of the test, the main frame was removed from the universal test rig and, according to the wishes of the manufacturer, cut into several defined parts and returned to the manufacturer.

Vibration measurements **via WLAN**



In the course of the forthcoming upgrade and speed increase on the Kiel–Lübeck rail line, vibration measurements were to be performed at the homes of local residents by the acoustics and vibration testing laboratory to record actual conditions prior to construction work. During a local visit with the project management team from DB Engineering & Consulting, ten representative houses were selected along the second construction section of the five planning packages. The affected residents or owners were asked in writing for their consent and a convenient appointment was agreed for the measurement.

In the past, a cable-based system was used for this type of measurement. Installation took a very long time and the many cables that had to be laid resulted in tripping hazards. Moreover, the manual evaluation was very time-consuming. This measurement saw the first use of a wireless measuring system that can also be battery operated if required. It enables vibration signals to be sent by WLAN from the house to the central data acquisition laptop outside, which receives and processes the data.

Using sensors on the track, the measuring instruments register each passing train fully automatically and record the vibration signals that occur inside and in front of the house, editing them automatically to match the duration of the passing train. In addition, data such as the class of the train is automatically recorded. Using this system, it is now possible to carry out a vibration examination compliant with DIN 4150 and DIN 45672 far more cost-efficiently than before. The measurements and subsequent test report prepared by DB Systemtechnik enabled the creation of more detailed vibration forecasts and the assessment of future immissions.

Photos: DB Systemtechnik

New cleaning systems
for wheelset reconditioning

New cleaning systems were required for wheel reconditioning at the DB Heavy Maintenance depots. DB Systemtechnik was commissioned to support the project from the initial call for bids, technical inspection and award of contracts through to the acceptance, delivery and installation of the cleaning equipment on site.

Apart from minimal handling and a high number of units, the key requirement of the specifications drawn up at the start was a very high quality of cleaning of the cylindrical roller bearings and axlebox housing. For this reason, continuous systems with automated transport and supply systems were to be used in order to achieve virtually unmanned processing in short operating cycles. After the award of the order to the future suppliers of the new systems, the manufacture of the systems and their installation commenced in the workshops of DB Heavy Maintenance.

The new facilities were ultimately designed for 24-hour operation with a throughput of more than 20 cylindrical rolling bearings per hour for the continuous system and approximately 12 load carriers per hour in the chamber system. The first tests indicated that, after washing, all components were free from grease and other adhesions even in places that were difficult to reach. The components were also dry, which was one of the main demands placed on the new machines. It was therefore possible to conclude the project with complete success in December 2016.

BR 714.1

Modernisation of locomotive
for tunnel recovery train

The DB Track recovery trains on the Hanover–Würzburg and Mannheim–Stuttgart high-speed routes required replacement. The recovery train concept provides for a train hauled by two locomotives with two transport coaches, an ambulance coach, an equipment coach and an extinguisher coach. Control consoles are integrated into the transport coaches, from which the recovery trains can be controlled free from external air in a smoke-laden environment. New coaches were to be procured while a full modernisation and approval of the locomotive Class 714.1 was planned on the basis of Class 212/714.

DB Systemtechnik was therefore commissioned to draw up the design solutions for the integration of the components with all the necessary structural, welding and safety verifications and to manage the new approval of the vehicles.

The following activities were to be provided:

- Coordination and preliminary examination of the locomotive concept and design
- Preparation of specifications for the invitation to tender for sub-components and subsystems, as well as supporting procurement
- Design and configuration of subsections and integration of supplied components
- Integration of a new motor, air-conditioning system, cooler and ventilator system, tank and battery system
- Design of control consoles in the transport coach
- Integration of vehicle electrics and of the train control into the locomotives and the recovery train
- Integration of cameras and design of camera housings for monitoring the tracks in the event of reduced visibility
- Design and integration of additional headlights for better view and illumination of the tunnel
- Consideration of homologation conditions such as profile clearance, performance of restriction calculations, mass management, inscriptions, fire protection, occupational health and safety
- Obtaining approval according to the memorandum of understanding (MoU)
- Approval management, including expert support (e.g. functional safety and brake)
- Accompanying and supporting the Bremen Depot in supervising production

Fotos: DB Systemtechnik

The tunnel recovery locomotives have already received approval so that the first train was able to enter service in Fulda.

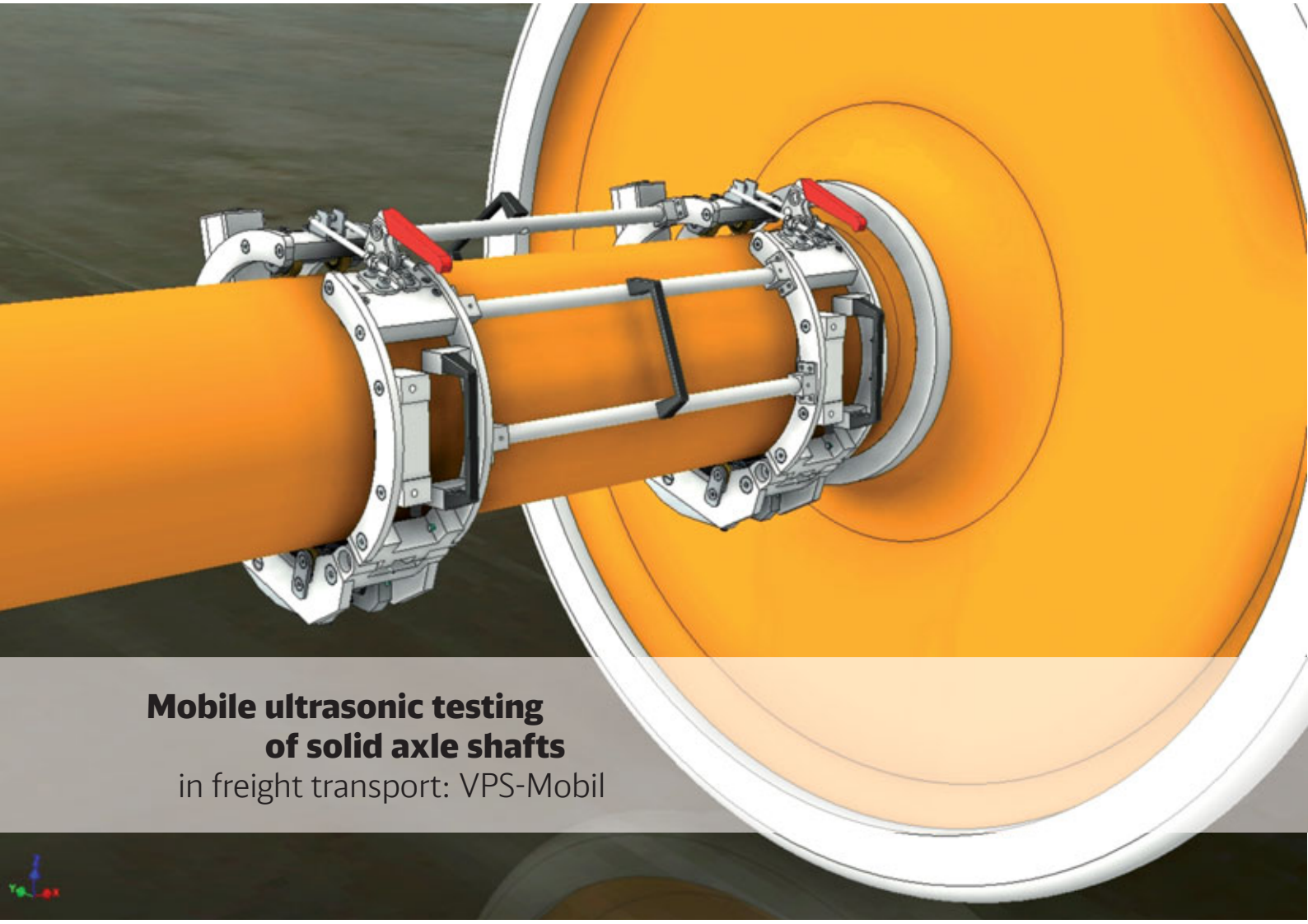
Acoustic measurements of the recovery locomotive

Acoustic measurements were necessary as part of the complete modernisation of the recovery locomotive and the associated EBA approval. Initially, measurements were to be taken to verify compliance with Noise TSI requirements.

However, as the locomotive was subsequently classified as a special vehicle, it was only necessary to demonstrate that the driver's cab noise levels and the warning signal horns complied with the requirements of UIC 651 and UIC 644. The acoustic verification measurements were performed by the Acoustics and Vibration Testing Laboratory of DB Systemtechnik, taking into account all general conditions of UIC 651 and UIC 644 and the DIN EN ISO 3381, DIN EN 15892 and DIN EN 15153-2 standards.

Due to non-compliance with the requirements of UIC 644 (concerning sound pressure level and basic frequency) because of leaks in the compressed air supply, the signal horn measurements had to be repeated. During the repeat measurements at the Bremen Depot, the locomotive was optimised and measured until all four horns could be adjusted so that the respective basic frequencies and levels complied with the requirements of UIC 644.

In addition to taking the measurements, the test laboratory implemented the entire operational and technical organisation. This ensured that all boundary conditions of the standards and regulations applicable to the measurements were fulfilled.



Mobile ultrasonic testing of solid axle shafts
in freight transport: VPS-Mobil

The necessary and regular ultrasonic testing (UT) of axle shafts, a non-destructive testing (NDT) technique, assumes a key role when guaranteeing safety in rail transport.

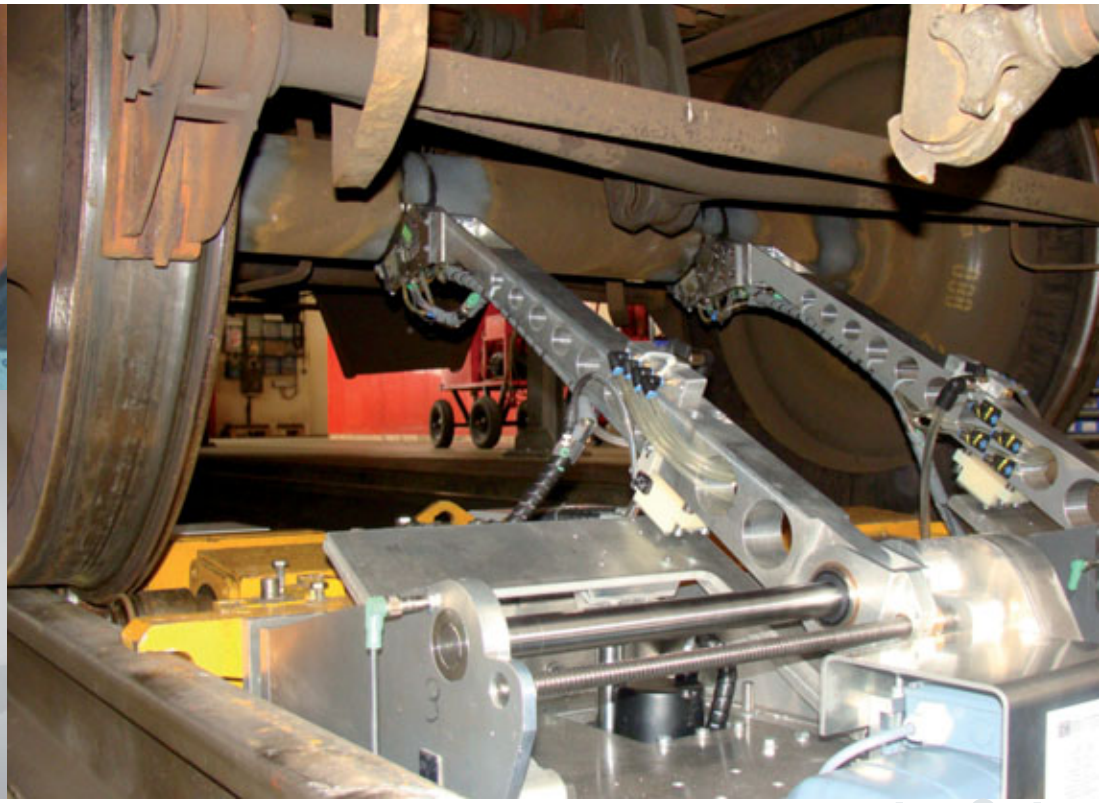
Solid axle shafts for the transport of corrosive freight are subject to inspections every two years and, in accordance with the state of the art, must be removed from the vehicle before being sent for ultrasonic testing. To achieve greater efficiency and to render this removal unnecessary, a prototype created by DB Systemtechnik is currently undergoing operational testing at the DB Cargo Maintenance Depot in Rostock. The VPS-Mobil (mobile solid axle shaft test system) permits the non-destructive testing of solid axle shafts for the detection of cracks – while they are still on the vehicle. The non-destructive testing department at DB Systemtechnik undertakes the support, evaluation, development and plausibility checking of the results.

The initial steps for experimenting with this test problem were the design of a system layout for guiding the probes to the axle surface and the predefined acoustic irradiation positions.

For the operational testing, a support was designed and manufactured for attaching the probes, and a feasibility study was carried out. By specifying the probe dimensions and the required adaptation of the soles, the framework conditions for an optimisation of the testing of solid axle shafts with up to three brake discs in their installed state was described from the start.

To guarantee the complete testing of a shaft surface in its mounted position on the vehicle, it is necessary to rotate the test equipment or the wheelset through 360 degrees. In the initial designs, the wheelset is raised by a lifting and turning device and then rotated during the testing process. This version facilitates precise and wear-free positioning of probes and testing of the acoustic properties as well as of the coupling and acoustic irradiation positions for subsequent use at the depot. It also served as support. In collaboration with DB Cargo, the first tests were carried

Fotos: DB Systemtechnik



VPS-Mobil

out on vehicles used for transporting corrosive cargoes. The experiences and construction options for modification arising from this field test were incorporated into the development of a prototype system. The extension of the test system by means of mechanised adjustment results in a complete test of the lateral surface of the solid axle shaft while still installed. The test of the solid axle shaft without removal is completed within 20 minutes and includes evaluation of the results, setup, inspection and cleaning times. In future, this time will be further reduced by adaptations to the movement of the system and optimisation of the process.

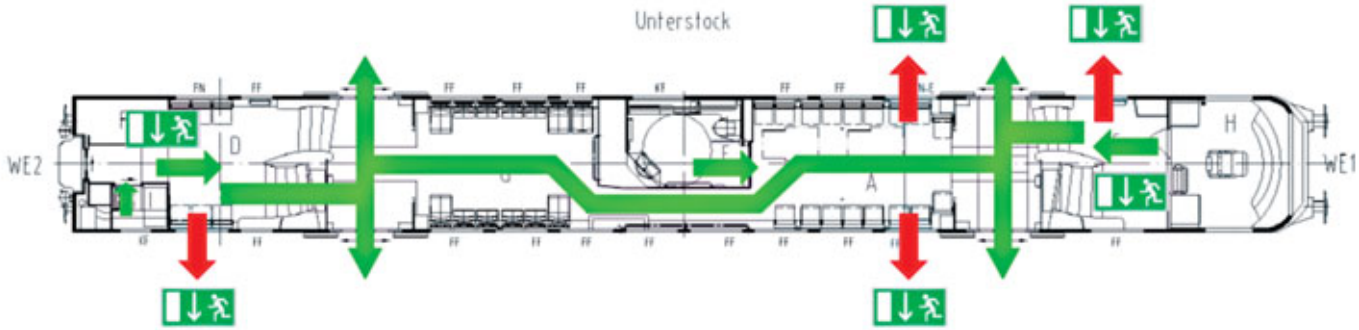
In the field of mechanised testing in the rail sector, the phased-array testing technology has now become state of the art. With this technology, the excitation of small ultrasonic elements at different times generates sound beams which can then be electronically controlled, pivoted and focussed. From four irradiation positions, this system will cover all areas of the surface by using ultrasonic beams with variable delays and angles.

The test system is set up using a test wheelset with saw notches. The amplification values of the ultrasonic beam are set on these saw notches, and, using integrated V transmission, the material characteristics of the various shaft types are determined in comparison with the test wheelset, so that a sensitivity setting and a comparable echo level assessment can be performed.

Each axle shaft is ultrasonically scanned in the test sequence from four different acoustic irradiation positions, thus enabling the complete lateral surface of an installed wheelset to be covered.

The satisfactory tests under operational conditions led to the creation of checklists and specification requirements for subsequent developments. Thanks to a new concept for the rotating cyclic test, in which the probes move around the stationary built-in wheelset, an additional increase in efficiency was achieved for the derived intermediate ultrasonic inspection after a period of two years. The wheelset test with the available test equipment according to the existing principle is to be continued until 2017 while also working on development of the new design.

Second multipurpose compartment
for Regio driving trailers



In the region of North Rhine-Westphalia a second multipurpose area has been incorporated into certain vehicles representing various types of driving trailer.

DB Regio has therefore called on DB Systemtechnik to carry out all necessary engineering services for this purpose. The tasks of the specialists from Wittenberge consisted of creating the conversion drawings and documents for the design files. The axle shaft capacity and brake loading were also calculated and the design freeze, the CSM (Common Safety Method) analysis and the fire protection concept were delivered.

From a technical viewpoint, the seating rows on the lower deck of the vehicles were completely removed and replaced by folding seats mounted on the side walls.

In the same context, various other operations were carried out, such as:

- Modification of the glass dividing panel
- Installation of additional handrails
- Implementation of emergency exit windows with removable rubber seals
- Additional installation of breakable windows with emergency hammers
- Installation of bicycle supports
- Adaptation of the floors and implementation of the passenger circulation concept
- Installation of additional welded-on parts for seat and handrail attachments
- Adaptation of the inscription markings

The project started in 2015 and will be completed in 2016.

Photos: DB Systemtechnik, DB AG/Rico Emersleben

Automatic gauge changeover equipment:
a product with a future?

In their study entitled "Automatic Gauge Changeover Systems", the International Union of Railways (UIC) and the Organization for Cooperation of Railways (OSShD) examined in detail the transition between system boundaries. Usual procedures at the transition between different gauges include the reloading of goods, the movement of passengers between trains, the substitution of vehicle wheelsets suitable for the other track gauge or the exchange of entire bogies with wheelsets of the other track gauge.

One technically sophisticated solution is provided by equipping the bogies with automatic variable gauge wheelsets and using lineside gauge changeover equipment. Using such a system, in which a vehicle's automatic variable gauge wheelsets are set to the other gauge on passing through the gauge changeover equipment, makes operations at the system boundaries faster, more convenient and safer. Set against this are the additional procurement, operating and maintenance costs. Over the years of this project, various automatic gauge changeover systems were developed, tested and also used on scheduled services. With the significant participation of the Wheelsets department of DB Systemtechnik, data from these automatic gauge changeover systems was collected, analysed and a report produced on the results gained.

Technical feasibility is only one side of the coin. The main objective is to reduce the time required for a change of gauge and to reduce any risks to transport. The framework conditions for use in passenger and freight transport, and the route (eastern Europe or Iberian broad gauge, special cases) differ considerably. Based on a study of the market, the profitability was evaluated and an Excel tool created for the individual cost/benefit evaluation.

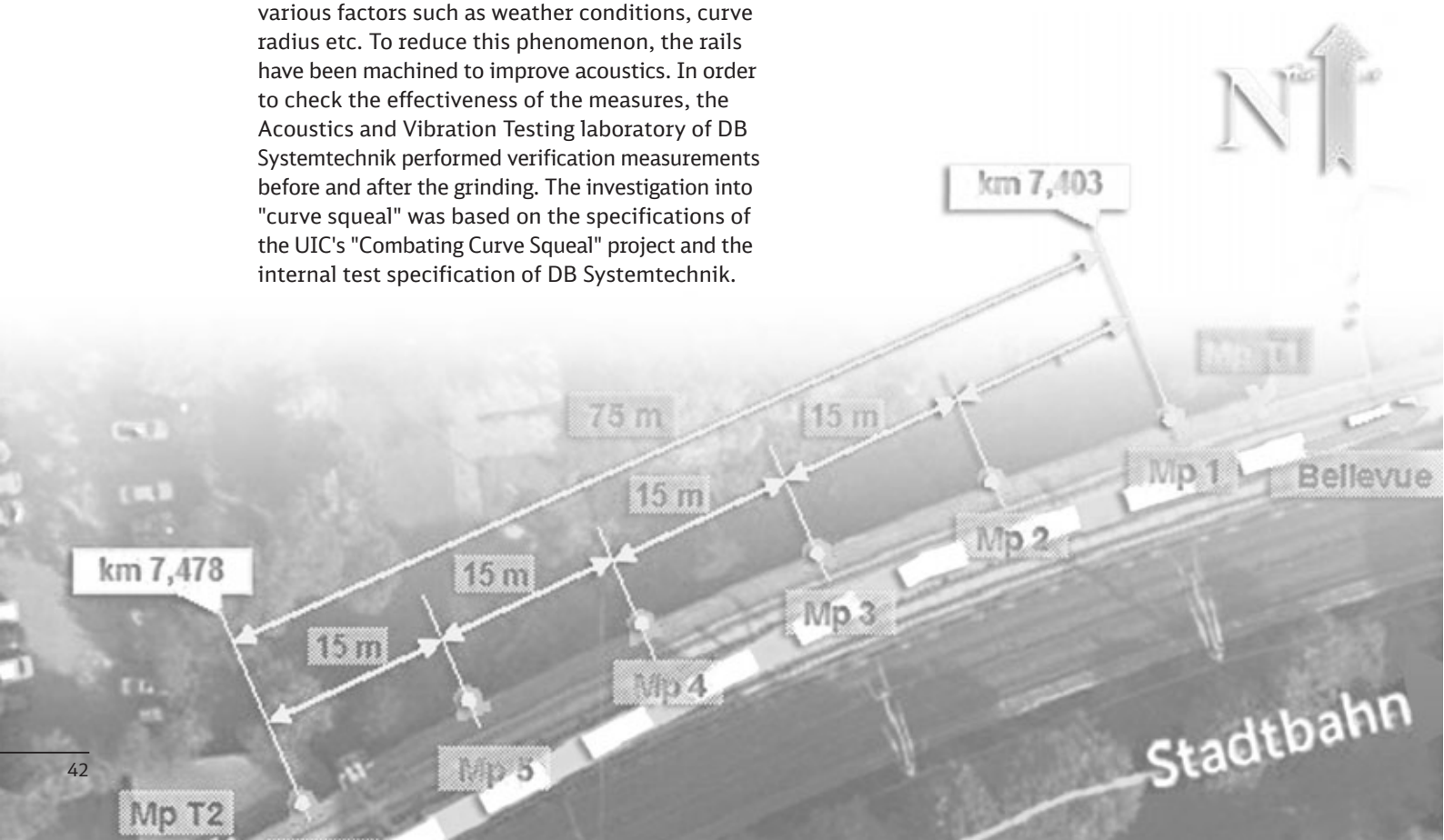
The requirements for the approval are defined in the UIC, EN, TSI, the regulations of the OSShD and in national standards. The aspects of a possible approval procedure have been highlighted by the experts at DB Systemtechnik.

Curve squeal on Berlin suburban train system

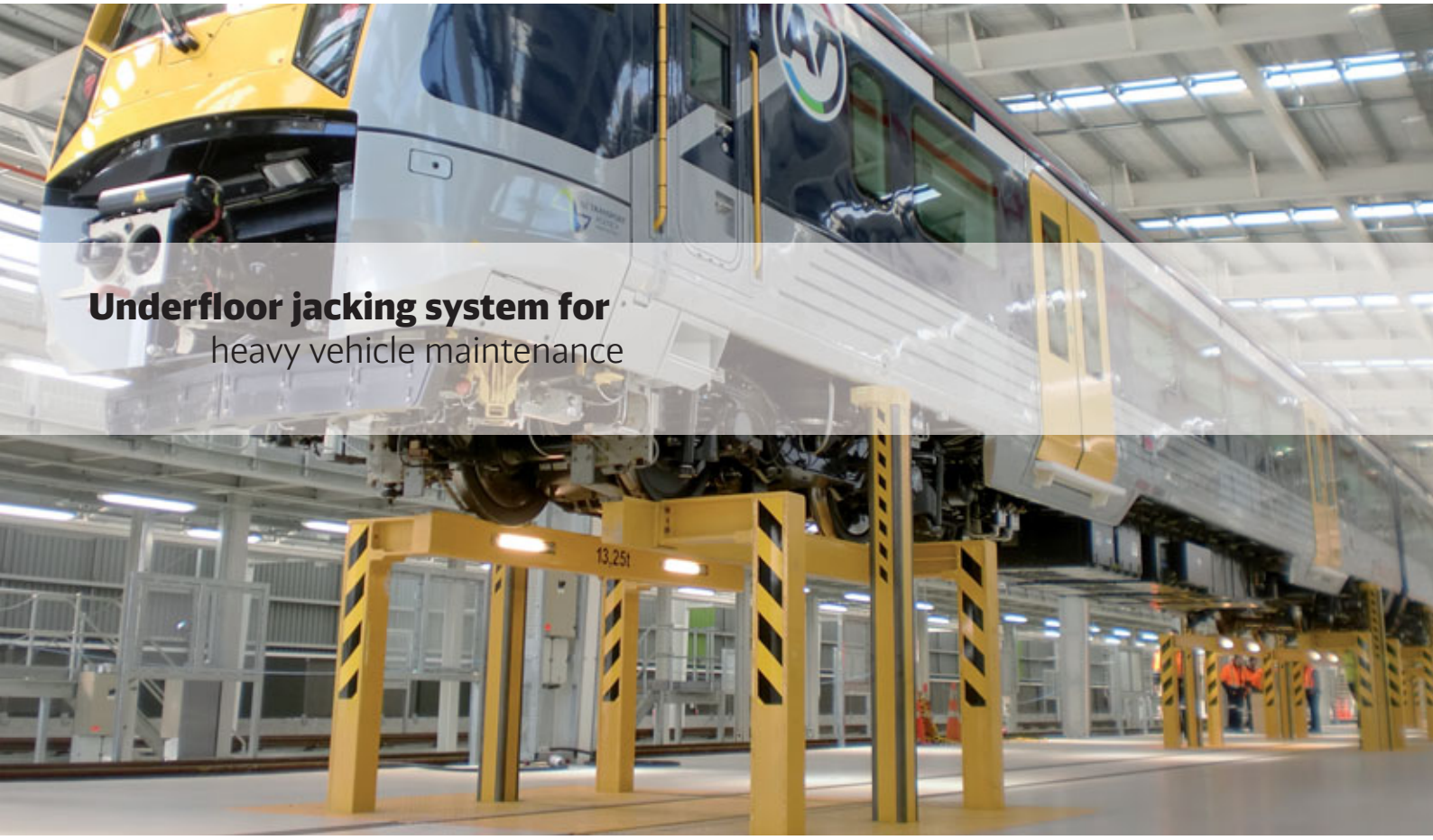
On the S-Bahn (suburban train) section between Berlin Zoo and Berlin Ostbahnhof stations, both S-Bahn tracks of the 6024 route have been upgraded. Following the track rebuild, an increasing number of local residents complained about the rail traffic noise levels. On track sections with tight curves, as is the case here, trains often generate annoying screeching sounds, known as "curve squeal", triggered by the transverse skidding movement of the wheels on the rails (longitudinal and transverse) on the inner rail and by the wheel flanges running against the inner edge of the outer rail.

This noises are of a pulsating nature and in the upper frequency range. The intensity and duration of the curve squeal can vary greatly, depending on various factors such as weather conditions, curve radius etc. To reduce this phenomenon, the rails have been machined to improve acoustics. In order to check the effectiveness of the measures, the Acoustics and Vibration Testing laboratory of DB Systemtechnik performed verification measurements before and after the grinding. The investigation into "curve squeal" was based on the specifications of the UIC's "Combating Curve Squeal" project and the internal test specification of DB Systemtechnik.

Due to the elevated position of the Berlin S-Bahn and the presence of buildings in close proximity to the line, accessing the line and installing measurement equipment along the curve present significant challenges. In addition, the measuring equipment was to be set up without any restriction of S-Bahn traffic operations. Due to the extremely high frequency of the suburban rail service, the presence of the conductor rail only a few centimetres above the top of rail and the limited space available next to the track, suitable safety measures had to be taken for the transport of the measuring equipment to the track section and for setting up the microphones along the curve. This project was able to demonstrate the clear effectiveness of the rail machining method.



Map: Bing, Photos: DB Systemtechnik, Fa. Windhoff



Underfloor jacking system for heavy vehicle maintenance

At the SBB industrial depot in Olten, Switzerland, growing numbers of multiple units are being overhauled without being uncoupled.

Unlike the passenger coaches that were previously processed at the depot, these vehicles carry numerous underfloor components. To remove and reinstall these, sufficient access must be ensured beside the train for lifting gear and industrial trucks. As an efficient solution for confined spaces the client decided to procure underfloor lifting gear.

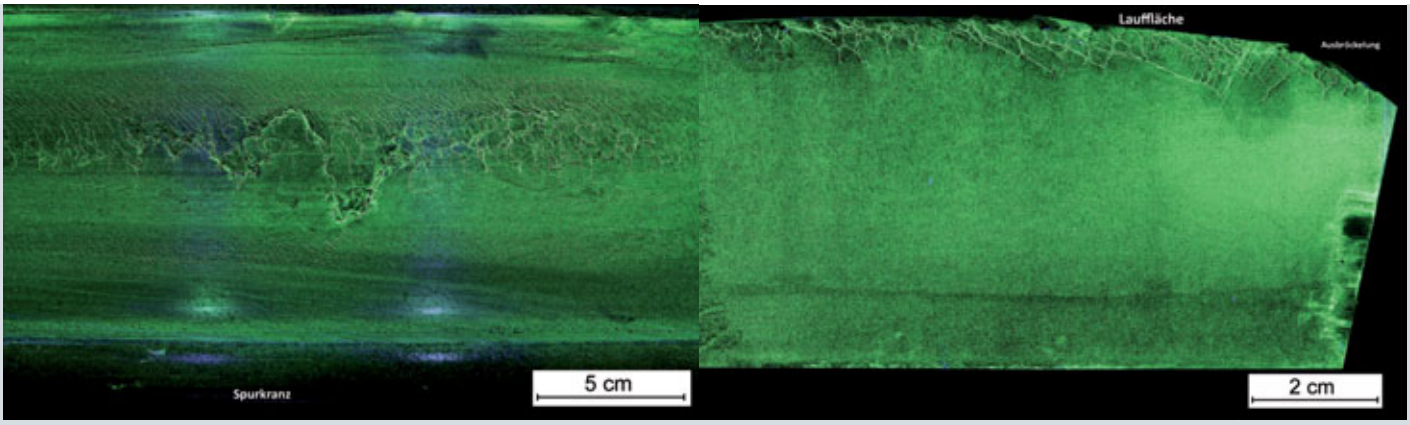
Initially, DB Systemtechnik was commissioned to carry out a feasibility study in order to lay the foundation for planning and procurement of an appropriate system under the local conditions (difficult subsurface conditions, restricted space, low ceiling, handling of different types of multiple unit).

The feasibility study examines the following points:

- Existing infrastructure of the Olten industrial depot
- Extending the vehicle strategy to include multiple units
- Possible variants for maintenance of vehicles
- Consideration of the structural engineering
- Cost estimates
- Submission of recommendations

The results of this feasibility study included a recommendation for the optimum variant for the subsequent planning of the underfloor jacking system in the Olten industrial depot, based on a selection of variants and the existing infrastructure.

A system specification was then prepared for the preferred option, which corresponds to a functional statement of work at Deutsche Bahn, as documentation for the open-market invitation to bid. This action is part of a bundle of adaptations for the further development of the Olten depot, which must be implemented during normal productive operation. Using the requirements specification submitted by DB Systemtechnik, bids were invited and the contract for the underfloor jacking system was awarded to a manufacturer of rail-specific plant engineering based in Rheine. Completion is planned for 2018.



Wheel tread damage to monobloc wheels of new local transport vehicles

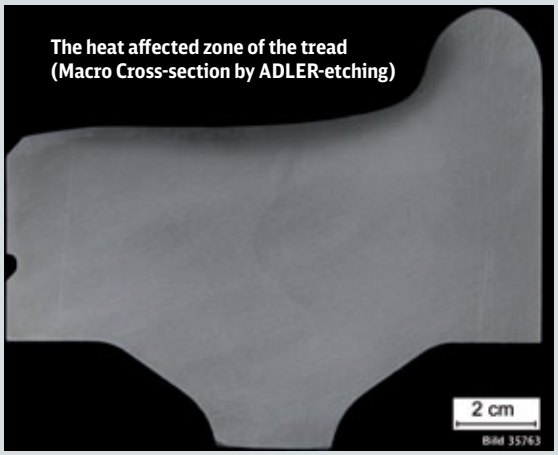
Inspection of new local transport vehicles in service in Sweden repeatedly revealed damage to the wheel treads of both powered and trailing wheelsets made of the wheel material ER8 after a comparatively low mileage. Reprofiling carried out to restore the target condition demanded comparatively severe machining. Wheel tread damage was even detected on wheels of one powered wheelset made of the ER9ISG test material. Both the damaged and undamaged wheels were subjected to comparative examinations with the aim of explaining the cause of damage.

The vehicle manufacturer therefore called on DB Systemtechnik to assist in explaining the cause of the wheel tread damage and offer support in devising corrective measures. For this purpose, the project was organised in two blocks:

- Material examinations
- Analysis and comparative evaluation of the available examination results, presentation of all results to the client and ensuing discussion

The results of the examinations revealed that intensive recurring slippage stresses during braking and starting procedures were causing the formation of pronounced heat-affected zones. In the affected areas the material near the surface was disproportionately subject to rolling contact fatigue (RCF).

Where thermally damaged areas coincided with areas of maximum contact stress, cracks began to form. Subsequently, these RCF cracks grew into a network and merged (surface break-up), which resulted in the pitting detected on the severely damaged wheels. As the less severely damaged wheels also had a heat-affected zone, it is to be assumed that the rolling contact fatigue would also have resulted in such damage after a further period of service.



The heat affected zone of the tread (Macro Cross-section by ADLER-etching)

As the RCF damage occurred on wheels from both powered and trailing wheelsets, it cannot be ruled out that, in addition to damage cause by brake slip, damage cause by traction slip also played a role. The wheels made of the test material ER9ISG showed identical damage patterns to those made from ER8 steel. Given the results of the project, the supplier was able to make further decisions. Thus it was decided not to pursue the use of the test material. Work is, however, actively proceeding on the optimisation of traction and brake software and control.

Photos: DB Systemtechnik

Refurbishment of **ICE 3**

After 15 years of operational service, the vehicles of the 403 and 406 Classes (ICE 3) are being modernised. The planned adaptations of the technology and comfort features should enhance both the availability and attractiveness of the vehicles, as well as improving profitability and safety. The vehicles will be upgraded for a further 15 years of operational use. In several phases, DB Systemtechnik is accompanying and supporting both the vehicle operator and DB Heavy Maintenance in the planning and execution of the refurbishment.

In the first phase, the preliminary project, the demands on the ICE 3 refurbishment implementation project were defined as well as the points to be considered when placing the order, whereby DB Systemtechnik supplied the specialist support for translating the requirements into measures that could be implemented and also helped to draw up the specifications. Configuration documents were created for evaluating the feasibility of measures and also as a basis for market enquiries in the course of the procurement process. In addition, the documents for the statement of work and supplier profile required as part of the measures were drawn up for Purchasing.

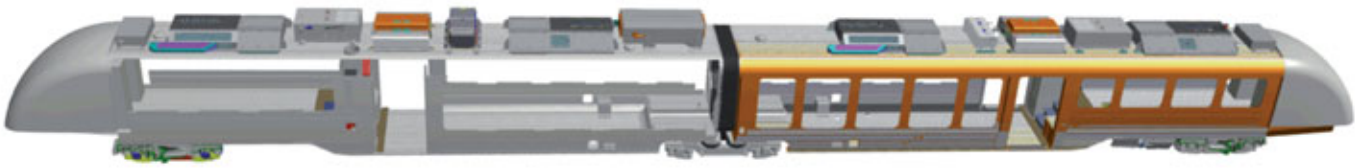
In the second phase, with the start of the implementation project, the design and manufacturing documents necessary for the design freeze and prototype construction were drawn up. During construction of the prototype, colleagues at DB Systemtechnik are supporting the Nuremberg Depot, offering specialist assistance for the conversion of the vehicles and forming the technical interface between suppliers, Purchasing and the depot entrusted with the implementation of the refurbishment. For the execution of the quality gates, in addition to providing design and manufacturing documents, expert reports and verifications will be created and assessed, e.g. when furnishing proof of the fire protection measures and strength calculations. In addition to removing the compartments in the 2nd class compartment coach, the restaurant coaches are being equipped with a lounge space for train personnel, for example.

To this end, colleagues from the Engineering department in Leipzig designed the lounge space and prepared the bid documentation for the procurement process. Apart from the mechanical integration into the existing vehicle design, the lounge space must not only be linked up electrically, but also connected to the existing HVAC system. This necessitates software adaptations that will be jointly drawn up and implemented in the vehicles by the HVAC department and the HVAC supplier. Having converted the prototype train, both the restaurant car and the converted 2nd class coach will be subjected to repeat measurements in the climate chamber in Minden and the completed adaptations verified. In a further project phase (serial production) following completion of the prototype construction, the design will be finalised and production supported. The existing vehicle documentation will be adapted and handed over to the customer.

New glass partitions are installed inside, the weight secures with a support on the luggage racks.

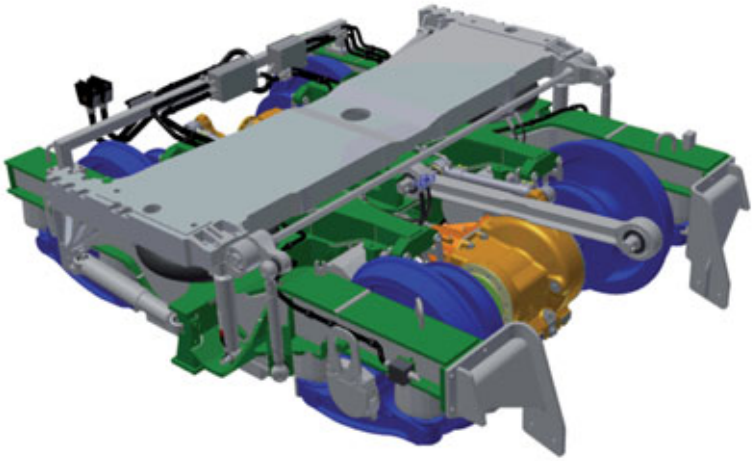
In the final project phase, warranty support, DB Systemtechnik will check any warranty claim in the case of defect notices on the vehicle or on components, state its opinions or assessments regarding the warranty claims and support the client in the enforcement of warranty claims against third parties. In the case of justified claims, corrective development will be carried out.

Eco Train for local transport in the Erzgebirge



The new contract for operating local transport in the Erzgebirge region will shortly be awarded and should be won by an innovative, energy-saving traction concept. For this purpose, a VT 642 will be converted for series use with innovative hybrid drive, control and auxiliary consumption technologies in connection with energy management compliant with the requirements.

DB Systemtechnik was therefore commissioned to develop the design solutions and to conduct the approval management, including the furnishing of proof. The upgrade concept essentially covers power electronics components, new CO_2 HVAC systems, and the preliminary setup for recharging by means of roof-mounted pantographs. The two diesel-mechanical traction modules will be replaced in one car section by a hybrid traction module with a diesel generator and in the other car section by a hybrid energy module with lithium-ion energy storage units, each section containing an electrical traction motor to drive the powered bogies. An energy-efficiency module predictively manages the energy flows between traction motors, energy storage units, auxiliary consumers and diesel generator, taking into consideration the demand for traction and the recuperation potential dependent on the progress of the journey.



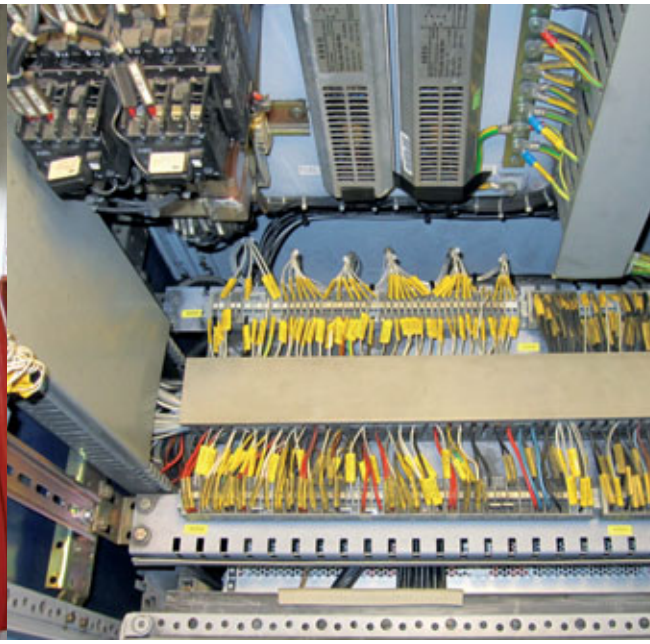
The bogies were redesigned by DB Systemtechnik to accommodate the higher axle loads and provide greater braking performance.

The experts at DB Systemtechnik were tasked with providing the following services:

- Preliminary examination of the vehicle concept for the design of the individual components
- Production of specifications for the invitation to bid for sub-components and subsystems
- Design of new bogies for higher axle loads and greater braking performance
- System integration in compliance with all vehicle-specific parameters and requirements relevant to approval (weight distribution, vehicle limitation profile, EMC, fire protection, etc.)
- Electrical integration of the new systems, including connection to the instrumentation and control technology in line with requirements
- Creation of the documentation relevant for approval (strength, vehicle weight, fire protection, running and braking tests, vehicle dynamics, protection against derailment, EMC, etc.)
- Approval management including expert support (e.g. functional safety and brake)
- Monitoring and support of the Chemnitz workshop as part of the production supervision and commissioning

The first vehicle is currently being converted in Chemnitz and commissioning is planned for the end of 2016.

Photos: DB AG/Günter Jazbec, DB Systemtechnik



New passenger information
for double-decker coaches

In response to customer demands, double-decker driving trailers of types 761.2, 762, 764 and 766 in Bavaria are to be equipped with an improved customer information system. The conversion is to be achieved by installing a new PIS computer, integrating a permanent automatic vehicle location system and establishing a GPRS radio link between train and land.

Bavaria Region selected the GSP company in its roles as hardware supplier and provider of the engineering services for integration in connection with replacement of old hardware. DB Systemtechnik was commissioned by DB Regio Bayern to draw up the necessary documentation that enables specialist personnel to integrate the new components into the existing vehicles. The engineering services provided presented DB Regio AG with conversion documentation, on the basis of which the components could be installed.

Acoustic power measurements **on a VT 650**

Since 1 January 2015, a new version of the regulation "Calculation of the assessment level for railways" (Noise 03) has been in force. The new version contains a few changes. For example, in the case under consideration here, the fact that stabling noise of rail vehicles is no longer classified as traffic noise, but as industrial noise and thus falls under the provisions of TA Noise. This means that the previously applicable values can no longer be used. As part of the planning approval procedure for storage sidings at Forchheim station, therefore, the new level had to be determined for the Class 650 vehicles to be stabled there. The stabling noise survey was required at short notice, i.e. within two weeks, for the acoustic planning of the storage sidings.

The Acoustics and Vibration department of DB Systemtechnik was therefore commissioned by DB Track to deliver the measurements of stabling noise for the VT 650, recorded in accordance with the TA Noise requirements.

In order to fulfil the order, the following services had to be provided

- Description of the measuring method required according to TA Noise
- Hiring of a Class VT 650 multiple unit, including a driver
- Selection of a measurement location with suitable low background noise
- Providing competent staff to set up the operational conditions
- Execution of the acoustic measurement including measurement report

In this process, an acoustic power measurement was performed according to the enveloping surface method. For reasons of symmetry, the measuring microphones were arranged around only one half of the VT 650. As a result, the objective of the order – the delivery of the measurement report on the stabling noise of the VT 650 – was fulfilled on schedule.

Image, below left:
Cross fracture surface with bright shiny, circular crack initiation region in the weld metal between rail web and foot; weld 1 and 3

Image, below right:
Cross fracture surface with semi-elliptical, highly corroded origin of fracture on the side of the rail head; weld 2

Examination of damage on **broken rail welds**

On the Berlin Ostbahnhof – Potsdam Main Station route of the Berlin suburban railway three welded joints had broken about three or four months after the rail was laid. In order to explain the cause of the damage, DB Systemtechnik was commissioned by DB Track to examine the material on the broken welds and submit its initial opinion regarding the damage as soon as possible.

Within just ten days the company was able to report that stress cracks due to a welding/production fault were the cause of the cross fractures in the welds. Further detailed investigations have shown that two broken welds originated from hot cracks (solidification cracks) in the weld metal between rail web and foot. Due to the longitudinal stresses in the rail, stress cracks formed at this point in the further development of the damage, which ultimately led to the cross fracture in these welds. The third weld break, on the other hand, was caused by stress cracks in a heat-affected zone subject to martensitic transformation on the side of the rail head.

Knowing the exact pattern of damage and its cause enabled the affected route section to be examined for similar damage by detailed ultrasonic testing of the welded joints. This avoided further weld fractures and thus the laborious and expensive replacement of rails. In addition, the welding personnel were made aware of the problem and reminded of the procedures to be used when welding rails.

Photos: DB Systemtechnik, SIEMENS

Rhein-Ruhr-Express (RRX)
mobility project

With an average of 2.4 million passengers using its network every day, North Rhine-Westphalia is one of the largest transport regions in Europe. In order to cope with the ever increasing numbers of passengers, the special purpose associations VRR, NVR, NWL, NRW, SPNV-Nord and the NVV, as well as the State of North Rhine-Westphalia, are proceeding with one of the most important mobility projects in the country: the Rhein-Ruhr-Express (RRX).

In this project, 82 Desiro HC double-decker vehicles manufactured by Siemens are being purchased and made available to the local transport operators Abellio and National Express.

DB Systemtechnik is supporting the client in the procurement process and undertaking the technical controlling as well as the inspections and acceptance tests accompanying the construction. The technical controlling is divided into the following three phases:

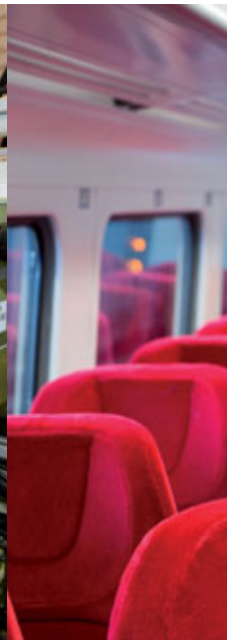
- Construction phase: Ensuring the appropriate design of the vehicles in line with actual needs and compliant with the regulations (participation in design reviews)
- Production phase: Guaranteeing high quality production (production supervision on site)
- Acceptance phase: Checking the documentation, the absence of defects and functional capability of the trains and of the agreed vehicle characteristics (vehicle acceptance)

Since the start of construction, the project members have been participating in the technical design of the vehicles.

During the construction phase, the experts from the Engineering department of DB Systemtechnik will be on site and will accompany the project through to the delivery and acceptance of all vehicles. At the request of the VRR, a workshop on the technology of electric multiple units took place in May 2016. The vehicles are due to enter service in stages starting with the timetable changeover in December 2018, and the process should be completed by 2020.

ESG Rail and Railway Approval Limited (RAL) are subsidiary companies of DB Systemtechnik in the UK. ESG employs more than 60 people at its Derby site. Railway Approval Limited (RAL) offers vehicle approvals and is accredited as a UK Vehicle Acceptance Body and internationally as a Notified Body for Interoperability.

www.esg-rail.com



ESG
Designed to deliver

Railway Approvals

Braking systems
for London Underground

ESG Rail concluded two contracts with the London Underground (LU) in 2015 and 2016. One concerns a four-year maintenance contract for the rail head moisture sensors, a facility that plays a vital role in the efficient network operation of the London underground system.

These sensors transmit data to the Adhesion Controller's Condition Assessment Tool (ACCAT) of the London Underground, which predicts the occurrence of slippery rails (low adhesion) on the Central and Metropolitan lines of the London Underground. This is a fundamental prerequisite for the operation of driverless trains on open-air sections of track subject to leaf-fall.

The second order from LU was for ESG braking system technology, in particular for the ESG wheel slide protection evaluation rig (WSPER) located in Derby. The object of the order was to perform evaluation and optimization tests on the sanding system monitoring software used in the electric multiple units of the London Underground (S-Stock). The aim of these tests is to ensure that the sanding systems are used effectively as soon as a vehicle has to be braked under low adhesion conditions. By simulating realistic operating conditions, WSPER furnishes proof that the brake equipment is tailored to the train and its train protection system.

The automatic train protection (ATP) system that is used in the underground system is likewise simulated in order to represent the braking behaviour of the train with greater precision.

Photos: ESG

New handrails for
Eversholt Rail Group

In 2015 ESG Rail received an order from the Eversholt Rail Group for the manufacture and delivery of handrails for the Electrostar fleet of Class 376 vehicles.

The 365 electric multiple units that are currently operated by Southeastern, require 1,440 new outside handrails in order to meet the requirements of the British TSI directive for persons of reduced mobility as well as the British Rail Vehicle Accessibility Regulations (RVAR).

ESG designed and manufactured this handrail and installed a prototype in a vehicle at the Slade Green rail depot.

C-DAS for
Stagecoach Group

In 2013 ESG Rail was awarded a contract by the Stagecoach Group for the turnkey delivery of the GreenSpeed driver advisory system in a total of 498 driver's cabs that are operated by the Stagecoach franchise South West Trains (SWT). A driver advisory system (DAS) is a highly developed, computer-aided driver assistance system for supporting the role of the driver.

DAS uses various different data sources for the calculation and ensures that the train reaches its destination on time with the lowest possible energy consumption. In this project, ESG cooperated with the Danish DAS Cubris company which has more than ten years of experience with the driver advisory system.

The Cubris GreenSpeed DAS is a recognised system that has been used throughout the entire fleet of the Danish State Railways since March 2012. The project has been in progress since 2015 and will be completed in 2016.

Trade fairs and activities
activities

Photos: DB Systemtechnik

Experts meeting Rolling Stock - **JR East and Deutsche Bahn**

At the General Meeting of Deutsche Bahn with JR East in October 2014, agreement was reached on an expert meeting for running gear design. Topics were to include combined use on high-speed and conventional rail routes, condition-based maintenance and the prevention of the accumulation of ice and snow in the bogie area. This expert meeting took place in Germany from 19 to 21 May 2015.

On the first day in Frankfurt, the strategic orientation of ICE and Shinkansen maintenance was discussed. The design criteria and operational experiences of Shinkansen and ICE running gear were then compared in the case of combined use on exclusively HSR and conventional tracks. On the second day, the modules of condition-based maintenance, such as the collection and analysis of condition data, conclusions for maintenance and establishment in maintenance regulations were discussed. Finally, at the ICE depot in Griesheim the design measures against ice and snow accumulation on the underside of an ICE train were explained and recently installed glycol system was visited. The new Velaro D multisystem train for international use was also launched there.

100 guests at the DB Systemtechnik **Customer Day 2016**

About 100 guests from the entire railway sector attended the DB Systemtechnik Customer Day in Munich. In addition to presentations by DB Systemtechnik and a guest lecture by Mr Kurt Bauer, Head of Long Distance at Austrian Federal Railways (ÖBB) in Vienna, participating customers enjoyed technical tours and specialist presentations on a wide range of topics.

Metro&Tram Customer Day in Brandenburg-Kirchmöser

The first Customer Day specifically for guests from the light rail sector took place on 24 and 25 February 2016. More than 10 specialist presentations and a tour of the unique test laboratories in Kirchmöser gave guests an insight into the range of services offered by DB Systemtechnik.

Eichstätt Grammar School Project on technical brochures

How much coordination is required so that trains are able to run on the tracks in Germany? Fourteen students from the Willibald grammar school in Eichstätt spent a year looking into this question as part of a project, resulting in a 60-page publication on the subject of new-build high-speed lines. They were supported in this task by experts from DB Systemtechnik and DB Track.

Photos: Björn Simnacher/Eichstätt, DB Systemtechnik

Aerodynamics Symposium in Munich: Micro Pressure Wave

At a symposium attended by around 60 delegates and held in Munich on 22 and 23 September 2015, DB Systemtechnik and the Japanese Railway Technical Research Institute (RTRI) presented the findings of joint research into micro pressure waves in tunnels. This collaboration began in 2014 in the field of micro pressure waves, currently a special topic within the field of tunnel aerodynamics. As part of this cooperation, the RTRI scientist Dr Miyachi spent a year in Munich as a guest of DB Systemtechnik. It is planned that a member of staff from DBST will be sent to Japan in 2017.

World Conference on NDT in Munich

From 13 to 17 June, DB Systemtechnik presented its entire range of services in the field of non-destructive testing at the WCNDT 2016 (World Conference on Non-Destructive Testing) in Munich.

At the conference, approximately 3000 professional visitors from around the world were able to share their views on NDT topics that affect the industry. DB Systemtechnik, which is also a member of the German Association for Non-Destructive Testing, played a key role in shaping this World Conference, e.g. with:

- eleven presentations on developments in NDT (both methodological and in the rail sector)
- the presentation of the new VPS-Mobil NDT system (see page 38), which enables solid axle shafts to be tested without the need for removal

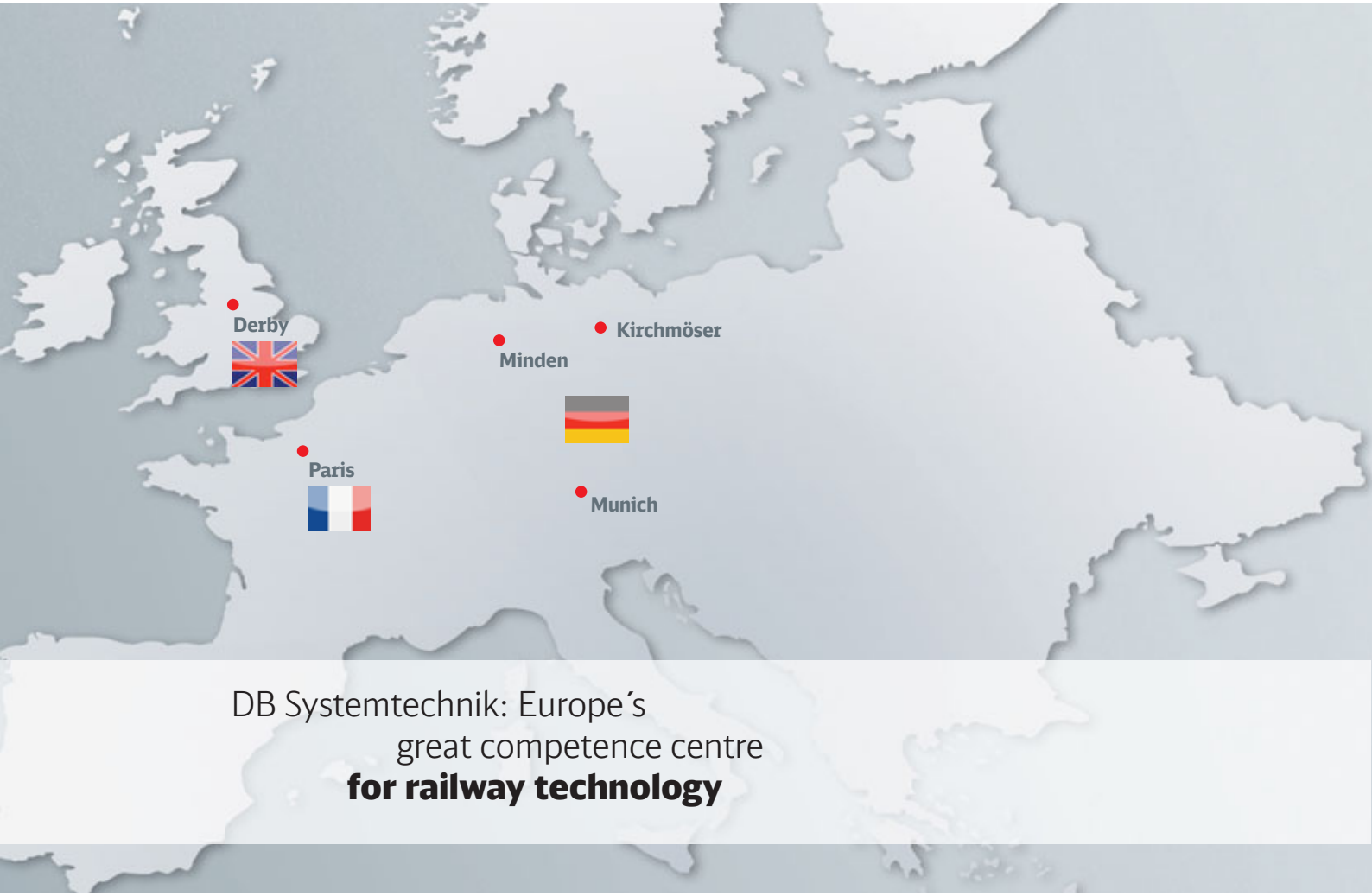
and with an information stand on the special range of services offered by DB Systemtechnik.

Further Events

TRAKO in Danzig from 22 to 25 september 2015

Eurasia Rail in Istanbul from 3 to 5 march 2016

Congress vehicle maintenance in Dusseldorf from 12 to 13 april 2016



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Errors and omissions excepted
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