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MAGAZINE
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InnoTrans - The Greatest Rail Show on Earth
InnoTrans*
Including: The InnoTrans Index
ISSUE FOUR 2016 - INNOTRANS SPECIAL

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Letter from the Editor

Welcome to the fourth Railway-News magazine issue of 2016, our InnoTrans Special.

Hosted in Berlin, Germany's capital city, it's by far the biggest and most important rail show in the world, 2016 being the 11th time it will be held.

This issue is packed full of many key players in the rail industry, all of whom are attending this year's InnoTrans show. To make navigating this issue as easy as possible for you, we have included an 'InnoTrans Index', where you can see all of our contributors listed along with their hall and stand numbers.

We kick off our InnoTrans Special with a comprehensive look at the show, past and present.

As this is a special issue, we have decided to forego our regular Europe and infrastructure features to focus entirely on contributors with a presence at InnoTrans 2016.
We spoke to Onno Szillis of Deutsche Bahn about their newly launched mindbox lab, based in Berlin, to find out what they do and what developments lie in the pipelines.
We also caught up with Niosha Kayhani about the Cubic Innovation Centre, launched by Cubic Transportation Systems in 2015.
Alstom's Ecodesign Director, Véronique Andriès, has written for us about 'The Recyclable Train'. Rail travel is not just the most environmentally sustainable form of transport compared to road, sea and air, it maintains its environmental credentials at the end of the trains' life-cycle.

Paul Bladon from Wayside Inspection Devices tells us about the evolution of rolling stock performance detectors.

Incidentally, the first time I visited Berlin, in 2014, I went on a guided walking tour to learn a bit more about the history of the city. I asked the guide how you could tell, these days, whether you were in East or West Berlin. And he said: 'the tramlines. They got rid of them in West Berlin but not in the East.' As such, I've always associated the city with trains and can't wait to be back in official train-related capacity, as it were.

All of us here at Railway-News hope you enjoy this InnoTrans Special. We debuted as a digital magazine when we covered InnoTrans in 2014 and we've grown quite a bit since then. Our next issue will be published in October and will feature our look back at the show with impressions, interviews, news and more!

If you can't wait until then, please follow us on Twitter (@Railway_News) and subscribe to our newsletter on our website: www.railway-news.com.
Enjoy the read!

Josephine Cordero Sapién, editor-in-chief

railway-news.com

ANDREW LUSH
Director
al@railway-news.com

JOSEPHINE CORDERO SAPIÉN
Editor-in-chief
jcs@railway-news.com

NICOLA BROWN
Head of Sales
nb@railway-news.com

AMBER GUY-KEMP
Head of Client Content
agk@railway-news.com

NAOMI THOMPSON
Contributing Editor
nt@railway-news.com

A2B Global Media Ltd
Third Floor
11–15 Dix's Field
Exeter EX1 1QA
United Kingdom

Office: +44 (0)1392 580002
Mobile: +44 (0)7432 725001

Email: info@railway-news.com
Website: www.railway-news.com

If you would like to submit editorial content, or you are interested in giving an interview for the magazine, please contact **Josephine Cordero Sapién**.
If you would like your company to join Railway-News's online platform, please contact **Andrew Lush**.

To subscribe to our newsletter, visit **www.railway-news.com**.

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InnoTrans 2016

Come and see us at Innotrans 2016 on stand 225E in City Cube A

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Contents

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InnoTrans – the Greatest Rail Show on Earth

By Josephine Cordero Sapién

InnoTrans – a Little Background

InnoTrans, a bi-annual trade show for the rail industry held at Berlin Messe, was established by the VDB (Verband der Bahnindustrie), the German Railway Industry Association, ZVEI (Zentralverband Elektrotechnik- und Elektronikindustrie), the Electro-Industry Association, DVF (Deutsches Verkehrsforum), the German Transport Forum and VDV (Verband Deutscher Verkehrsunternehmen), the Association of German Transport Companies. UNIFE (Union des Industries Ferroviaires Européennes), the Association of the European Rail Industry, got involved at a later date too.

InnoTrans first opened its doors in Berlin in 1996, after the rail industry had decided they needed an international trade fair. Berlin was chosen for several reasons, for example its central location between east and west and its long-standing presence as a rail technology hub. That year, 172 companies exhibited at the show. In 1996, the rolling stock exhibition could not yet be held at Berlin Messe due to the venue's lack of outdoor facilities, but that problem had been fixed by 1998. By the year 2000, InnoTrans had become the leading trade fair for rail transport technology. In 2002, the show saw more than a thousand exhibitors for the first time. This was the same year the Virtual Market Place was launched.

By 2004 there were guided tours of the grounds and in 2006 Deutsche Bahn started its DB Awards for the Best Suppliers.

In 2008 the opening ceremony was attended by an EU Commissioner for Transport for the first time and the track at the

outdoor display area was extended to its current 3500 metres.

The number of exhibitors reached 2000 in 2010 and in 2012 all the exhibition space at Berlin Messe, a venue consisting of 38 halls (in that year) along with its outdoor display area, was fully booked for the first time.

InnoTrans 2014 Roundup

InnoTrans then celebrated an anniversary in 2014, being held for the tenth time. The number of halls increased to 40 with the inclusion of the CityCube building. 2761 exhibitors from 55 countries participated in the show two years ago, featuring 149 vehicles on the outdoor tracks. 2014 also saw the debut of the Future Mobility Park, a display area for the most cutting-edge transport concepts;

while the outdoor area featured a new special gauge display.

At the last InnoTrans in 2014, 140 products had their world premiere.

Matthias Steckmann, Executive Director at InnoTrans, said:

"There is no doubt that the tenth InnoTrans was the hitherto biggest showcase for engineering skills and solutions for mobility. Moreover, the fair has never been more international: 61 percent of exhibitors travelled from abroad (...)."

InnoTrans is about more than just showcasing companies and new developments in the rail industry. It is a place to sign contracts and find new jobs. For example, Deutsche Bahn and Polish rail company Pesa signed a contract worth 100 million euros for the supply of 26 Link trains to Bavaria, while Alstom and Vossloh signed a

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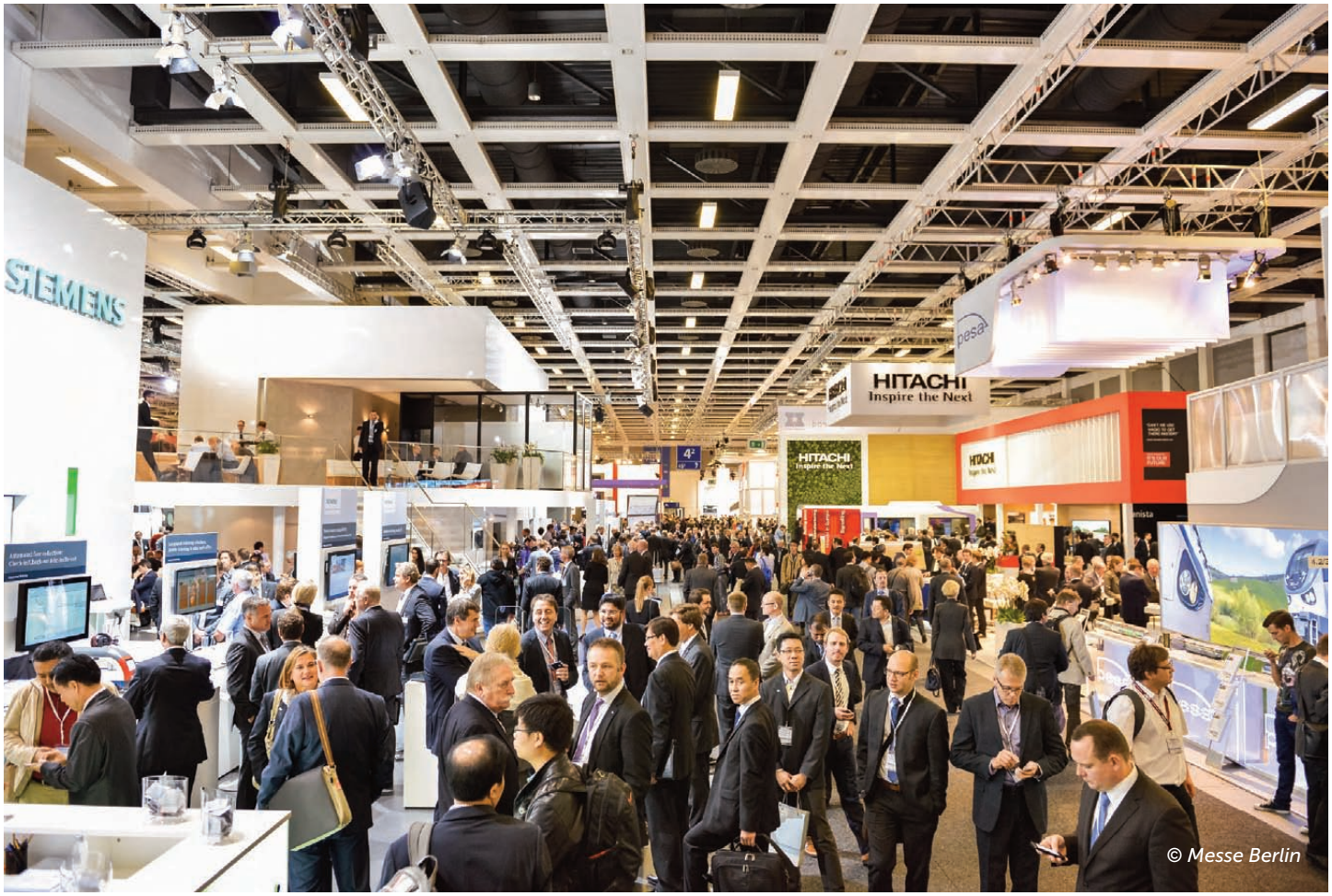

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contract worth 11 million euros to install the latest train control system (ETCS) on Vossloh locomotives.

So what lies in store for InnoTrans 2016?

InnoTrans 2016 will open officially on Tuesday, 20 September, when the opening ceremony will be held at 10am in the Palais am Funkturm. The speakers at the welcome address are CEO of Berlin Messe GmbH Dr Christian Göke, Federal Minister of Transport and Digital Infrastructure Alexander Dobrindt and the EU Transport Commissioner Violeta Bulc. This address will be followed by a panel discussion with representatives from Deutsche Bahn, VIA Rail Canada, the Association of German Transport Companies, Bombardier, Siemens and Alstom.


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Several companies will be holding press conferences throughout the show, starting on Monday, 19 September. After the opening press conference and press tour, Frauscher Sensortechnik will speak on live tracking at 3.30pm (Press Centre Hall 6.3 Room A). Companies like Stadler, Bombardier, Alstom and Rolls-Royce will all put on presentations and press conferences to showcase their latest innovations.

This year InnoTrans will focus on five key areas to provide comprehensive coverage of all aspects of the rail industry:

- **Railway Technology**
- **Railway Infrastructure**
- **Public Transport**
- **Interiors**
- **Tunnel Construction**

The Future Mobility Park will once again present the most innovative ideas and products aiming to push the rail industry forwards, such as Hyperloop Transportation Technologies (USA), who along with Hyperloop One (USA) and TransPod Inc. (Canada), want to present this whole new way of travelling.

The show is once again set to grow with more than 200 first-time exhibitors, with a total of 2,940 exhibitors representing 60 different countries attending.

But this growth isn't just limited to numbers. New developments are also under foot: 2016 marks the debut of the CUBE start-up programme. Innovative start-ups will be given the opportunity to pitch for 8 minutes to managers and decision makers in the industry. The winners will be given two tickets to the invitation-only CUBE Tech Fair, held in May 2017 as well as a pitching slot in the 'Infrastructure & Interconnectivity' area. This event will take place Wednesday, 21 September, 10am–1pm, at the Old Cinema at the Marshallhaus at Berlin Messe ExpoCenter City.

InnoTrans 2016 will feature a Speakers' Corner, modelled on its famous counterpart in London's Hyde Park, where company representatives are given 60 minutes to speak on a topic of their choosing in a format that is also entirely in their hands.

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On Friday, 23 September, the last day of the show, senior executives are given the opportunity to participate in individual guided tours to allow them to visit their most important suppliers. As these tours are accompanied by media representatives, they will allow the senior executives to establish personal contacts at the highest level.

No article about InnoTrans would be complete without a mention of the InnoTrans Convention, the perfect venue for panel discussions and expert talks on the transport issues facing us moving forward.

© Messe Berlin

The main focus here is the Dialog Forum with different talks, such as on digitalisation and ERTMS being held in the Palais am Funkturm, North Entrance, on 21, 22 and 23 September.

The Rail Leaders' Summit, a by invitation only event, is organised by Deutsche Bahn AG, the Federal Ministry of Transport and Digital Infrastructure and Messe Berlin GmbH and will take place 20 September, 3pm–5pm, Hall 7.3, Room Berlin. This year's topic will be 'Innovation in the Digital Age: Rail Faces the Challenges of the Future!"

Other areas of the Convention include the International Tunnel Forum, the Public Transport Forum, the Public Transport & Interiors Forum and the International Taiwan Business Circle (by invitation only).

Lastly, it would be an absolute sin not to mention the Oktoberfest Tent under the Funkturm where exhibitors and visitors can recharge their batteries while enjoying some Bavarian flair. Exhibitors can reserve tables and book the venue for exclusive evening events too.

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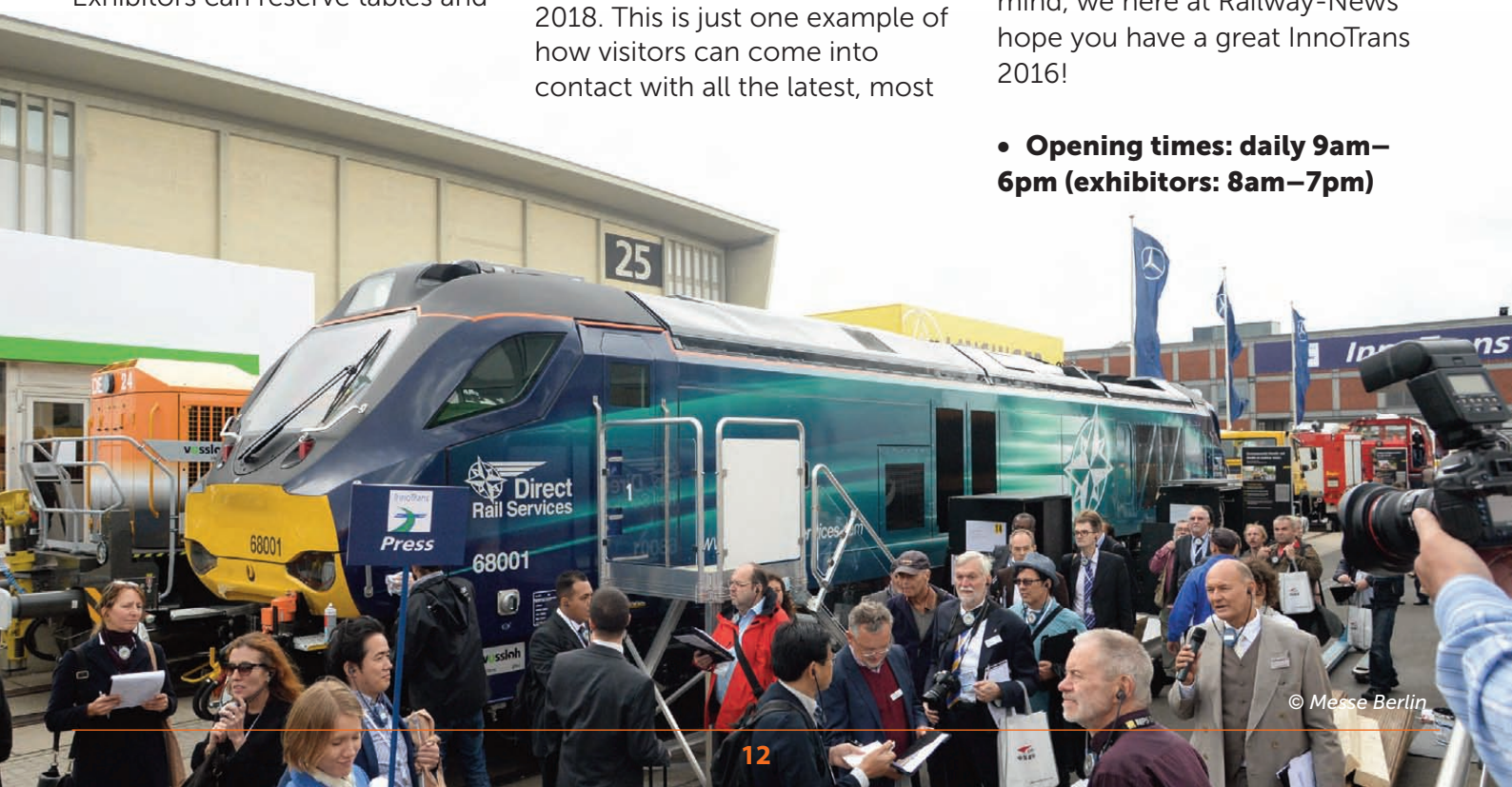
I personally have always been particularly impressed by the engineering feats of tunnel construction. German company Herrenknecht, who supplied 8 1,000 tonne TBMs to drill 42km of tunnel for London's Crossrail project, will inform visitors about this impressive project in 2016. The Crossrail line has now been renamed the Elizabeth Line and is due to commence operation in 2018. This is just one example of how visitors can come into contact with all the latest, most cutting-edge projects and products in the rail industry right now, be informed and be inspired by the industry as a whole so that when we return for InnoTrans 2018, passengers in the British capital will be benefitting from the expertise and products provided by Herrenknecht, just as passengers and freight companies all around the world are doing thanks to the innovative developments occurring in the rail industry all the time. With that in mind, we here at Railway-News hope you have a great InnoTrans 2016!

- **Opening times: daily 9am–6pm (exhibitors: 8am–7pm)**



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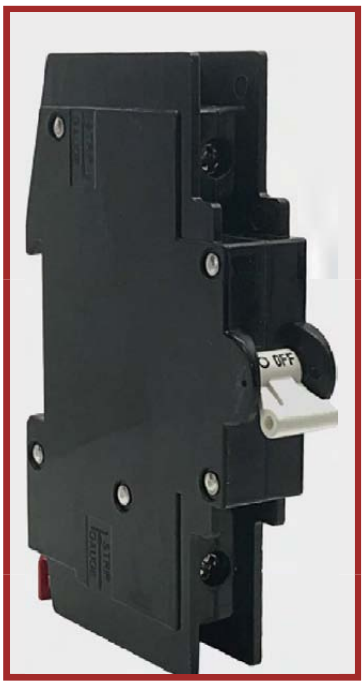
- Meets IEC spacing requirements
- UL489, UL1077, CSA & TUV



E-Series

Ideal for high current and high voltage applications. Certified as a supplementary protector and as a manual motor controller.

- 1-6 Poles
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- UL489, UL1077, CSA & VDE

F-Series

Ideal for high amperage, high current and critical applications having inductive loads under extreme temperature conditions.

- 1-3 Poles
- Ratings: 100-700A, up to 125VDC, 277VAC
- UL489, CUL Certified & TUV

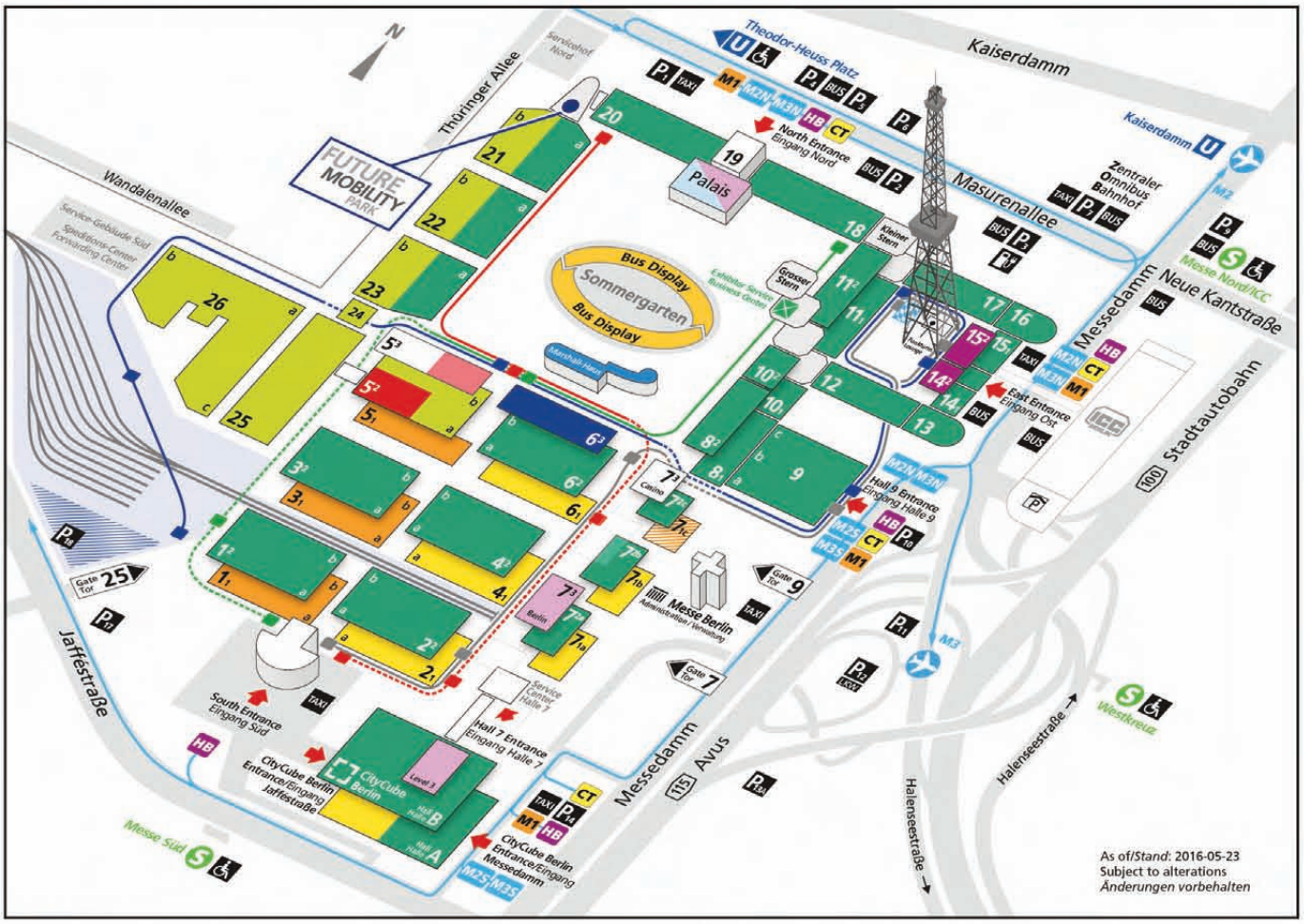
InnoTrans Index

Berlin ExpoCenter City

Messe Berlin

Exhibition grounds
Geländeplan

InnoTrans 2016
20 – 23 September · Berlin



- Railway Technology
- Interiors incl. Travel Catering & Comfort Services
- Railway Infrastructure
- Tunnel Construction
- Public Transport
- Outdoor Display Gleis- und Freigelände
- Special Gauge Display
- Bus Display
- Opening Ceremony Eröffnungsveranstaltung
- InnoTrans Convention incl. PTI-Forum
- Speakers' Corner Conference Corner
- Career & Education Hall
- Business Lounge (Marshall-Haus)
- Press Center Pressezentrum
- Restaurant „Meet'n'Eat"
- Restaurant „Oktoberfestzelt"

Shuttle Lines · Shuttle Linien

- M1 — Olympischer Platz P+R
- M2N — **Airport Tegel – Expo North** Flughafen Tegel – Expo Nord
- M2S — **Airport Tegel – Expo South** Flughafen Tegel – Expo Süd
- M3N — **Airport Schönefeld – Expo North** Flughafen Schönefeld – Expo Nord
- M3S — **Airport Schönefeld – Expo South** Flughafen Schönefeld – Expo Süd
- HB — Hotel Transfer
- CT — City Transfer

Fairground Shuttle · Geländeshuttle

- **Fast Shuttle South Entrance – Hall 18** Eingang Süd – Halle 18
- **South Entrance – Hall 20** Eingang Süd – Halle 20
- **South Entrance – East Entrance** Eingang Süd – Eingang Ost
- **East Entrance – Outdoor Display** Eingang Ost – Freigelände

Messe Berlin GmbH · Messedamm 22 · 14055 Berlin · Germany
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WINDHOFF - Ready for the future

At this year's InnoTrans, WINDHOFF will exhibit a compact, 2-axle rail vehicle for construction work, service and maintenance tasks.

High engine output and ample towing force distinguish this versatile vehicle. Power is provided by a main diesel engine and a smaller auxiliary diesel engine. The self-propelled vehicle can travel up to 100km/h and meets current demands for low fuel consumption, low noise emission and ergonomic work places. A powerful loading crane with remote control allows for the handling of rail sections, concrete construction elements as well as overhead line system components. The quick-attach system at the buffer front offers a wide variety of winter equipment. These attachments are powered by the on-board hydraulic system. The driver's cabin is another highlight. Aside from two driver positions there are seats for additional personnel. All materials used in the cabin have been selected in compliance with current fire protection guidelines.

Besides that, WINDHOFF is going to show a rail/road shunter ZRW50AEM with battery-eletric drive as well as a wheelset rotating device with an ultrasonic inspection system. In addition several hydraulic attachments for heavy-duty applications on rail construction sites can be be seen at the WINDHOFF display at the open-air site, stand no. O/427.

With its two sales areas – railway technology and the complete range of railway vehicles – WINDHOFF Bahn- und Anlagentechnik GmbH is well prepared for future challenges. The company's success is based on the realisation of customer-specific demands due to a perfectly designed modular system which achieves all appropriate certification criteria and provides for maximum customer value.

WINDHOFF rail vehicles are successfully used world-wide for the construction and maintenance of rail tracks, overhead catenary systems, and dedicated designs serve as fire-fighting and rescue vehicles for main lines, branch lines and metros.

Railway technology is another main sales area at WINDHOFF. Railway depots around the world have selected workshop equipment made by Windhoff. Besides the production of lifting jacks and complex lifting installations, work platforms, turntables, bogie measuring stands, bogie drops, bogie scales, wheelset lathes, wheelset change assemblies and traverses, the company also provides full planning and system management services for major construction projects.

The shunting sector covers – besides a complete range of rail/road shunters – dedicated solutions for state or industrial railway operations and ports, starting with simple rope winches, rope traction and shunting systems with slingchains as well as solutions with wheelset carts or buffer wagons.

Just recently WINDHOFF Bahn- und Anlagentechnik GmbH obtained an order for the delivery of six rail/road shunting vehicles from Delhi Metro Rail Corporation Ltd. (DMRC), which is the purchase division of Indian Railways and responsible for central purchasing for metros in all of India. Four of these vehicles (ZRW50 AEM) were delivered in March, and the fifth unit (ZRW125 AEM) was shipped to India just recently. Another unit, a follow-up order for a ZRW50 AEM, is presently in the production stage. The five ZRW50 AEM units come with service weights of 12 tonnes for 50 kN towing forces. They are used for the towing and positioning of metro trains during their service and maintenance stays at the depots.

The ZRW125 is an ideal solution for heavy-duty shunting services.

With a 29-tonne service weight, this powerful vehicle features a 125 kN towing force to handle train weights of up to 2,000 tonnes along level tracks. From the modern ergonomic cabin the driver has a clear and unrestricted view over the whole working area.

All vehicles feature battery-electric drive systems for low-emission operation. Aside from the general performance data, the WINDHOFF rail/road shunting vehicles impress with their service and maintenance-friendly configuration and position of all components. Virtually all service positions are in easy reach.

DB's Mindbox: In-House Innovation

Wanting to stay at the forefront of innovation, Deutsche Bahn have opened their own innovation lab in Berlin. I spoke with Onno Szillis to find out more.

By Josephine Cordero Sapién

Can you tell me a little bit about what you do at mindbox and why it was set up?

The digital shift is in the process transforming mobility, all public transport but also the working environment quite fundamentally. Deutsche Bahn has launched a company-wide push towards digitalization to provide a lasting improvement to its processes and services with regard to its customers. DB is working on more than 260 projects, from passenger and freight rail traffic, logistics and infrastructure to production, IT and the working environment. Opening up to innovation from the outside, such as by collaborating with start-ups, is central to this.

The way of working is also changing: DB's innovation labs have a start-up atmosphere. DB mindbox, located in the Jannowitzbrücke Station in the heart of Berlin, near to the hotspots of the start-up scene, houses Deutsche Bahn's Accelerator.

As part of the DB Accelerator programme focusing on infrastructure, start-ups collaborate closely with DB's infrastructure bodies to develop technical prototypes and business ideas over the course of three months that, if successful, are implemented into operations. In addition to 25,000 euros, the

© Deutsche Bahn AG

start-ups are given office space in the mindbox for three months. In addition DB makes its know-how, its network and mentors available to the start-ups. The Accelerator programme is to run at least three times per year.

What is the relationship between mindbox and Deutsche Bahn?

DB mindbox is part of Deutsche Bahn and is run as part of the remit Chairman of the Board Dr Rüdiger Grube.

Do you think Deutsche Bahn overall is quite innovative in its approach?

Many companies now run their own accelerators or they co-operate with them. DB considers it an innovative approach to work with start-ups as equals, allowing them to test their products at DB with the help of a DB mentor: be that on tracks, at a station or any other location. It is also of central importance that the innovations have a customer benefit at their heart, i.e. new services and / or higher quality.

Can you give me some examples of ideas that have been developed at mindbox and that have now been implemented in the real world? How long does implementation take?

DB mindbox was formed in November 2015. As a result, examples of implementation in the railway sector are not yet very plentiful – and it is well known that in this area it takes quite a while for anything to be implemented. But such examples exist!

KONUX Railway Sensor mounted on switch crosstie

© KONUX

eMio is an electric scooter in the 'shared economy' that will soon be made available to customers as part of Flinkster. Flinkster is DB's car-sharing service. This will give our customers even more options to complete their door-to-door journey.

Start-ups that have innovative ideas for services at stations can test them in a pop-up store at Berlin Central Station. Last year this was TeaTales. This year, HaferKater will offer travellers speciality porridges in the station.

The sensors made by KONUX are about to see their first use on the Deutsche Bahn network; an initial series is currently in production. These new sensors allow turnout sleepers to be monitored in real time.

How international is mindbox?

Up until now mindbox has seen applications from start-ups from 15 countries. Two weeks ago we had a road show in Israel. However, a majority of the teams were from Germany. That can and should change. Innovations don't stop at national borders.

What has been the biggest success of mindbox so far?

We were pleased that we were able to open DB mindbox on schedule last November after a short construction period. Since then DB mindbox has been open to external innovators and railway employees. The last hackathon alone had 190 participants.

From an outcome perspective we are particularly proud of the success of KONUX. The points sensor is a major step forward and will – presuming successful testing – improve quality and the associated punctuality.

What do you see as the most urgent problems rail has to address to remain relevant?

It is one of Deutsche Bahn's goals to increase the desire to innovate within DB. This is a challenge for the rail sector in general. Then there is the speed of implementation. Many innovations take too long to reach the market. Using an agile approach, small steps and a willingness to turn around, the start-ups at DB mindbox are demonstrating how it can be done.

What lies in store for mindbox over the coming months and into the next couple of years?

The next pitch day is on 13 September. It is also the demo day for our current batch. We would like to become more international, work even more intensively for the whole of DB and, first and foremost, we want to work on an attractive railway system together with the start-ups we're already co-operating with and with the many more we'll be involved with in the future.

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Showcasing motion and control solutions

Parker Hannifin to exhibit at InnoTrans 2016

Parker Hannifin will again be exhibiting at this year's InnoTrans rail exhibition in Berlin. Visitors to Parker at Stand 209 in Hall 10.2 will have the opportunity to see a wide range of components and solutions from multiple technologies on offer to the rail industry and to discuss their applications with the company's experts.

With its broad and innovative product range, Parker is able to satisfy a wide variety of customer requirements, effectively acting as a 'one stop shop' to serve the needs of the latest motion and control systems and applications in the rail sector and help drive advancements in the industry.

Parker's stand at InnoTrans this year will feature products and solutions found in all areas of the rail vehicle. These include air treatment and filtration equipment for pneumatic systems, control valves and related components designed specifically for rail applications, plus integrated control systems for applications such as pantographs, doors mechanisms and couplings. The company's range of rugged hoses and connectors designed and approved specifically for use in rail applications will also be on display.

Examples of Parker's motors and drives used successfully in other sectors of the transportation industry such as the on and off-road vehicle markets with potential to be used in the rail sector will also be featured. These include technologies used in applications as diverse as electric racing superbikes recently seen at the Isle of Man TT Races, to bus e-steering systems and commercial vehicles ancillaries.

Parker's broad and deep range can also help procurement professionals within the rail industry reduce supplier bases. As a consequence, logistics can be simplified, and by adopting a systems-oriented approach where multiple components are combined into a single system which is then delivered to the customer, with the total cost of ownership reduced and production accelerated. A single part number for an assembly reduces the number of orders raised as well as the quantity of deliveries and stock locations, minimising the overall logistics burden for the customer.

Come and visit Parker at InnoTrans at Stand 209, Hall 10.2 from 20–23 September to see a comprehensive range of solutions for the rail industry and discuss your application needs with the company's motion and control experts.

For further information or assistance prior to InnoTrans, please contact Parker at rail@parker.com or visit parker.com/rail

About Parker Hannifin

With annual sales of approximately $13 billion in fiscal year 2015, Parker Hannifin is the world's leading diversified manufacturer of motion and control technologies and systems, providing precision-engineered solutions for a wide variety of mobile, industrial and aerospace markets. The company employs approximately 55,000 people in 50 countries around the world. Parker has increased its annual dividends paid to shareholders for 59 consecutive fiscal years, among the top five longest-running dividend-increase records in the S&P 500 index. For more information, visit the company's website at **www.parker.com**, or its investor information website at **www.phstock.com**.

MECHAN

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Mechan jacks up InnoTrans presence

Rail depot equipment specialist, Mechan, will be turning the spotlight on its flagship lifting jacks at this year's InnoTrans exhibition.

For the first time, visitors will be able to see the Sheffield-based heavy lifting expert's eye-catching apparatus in action from September 20–23 on stand 206E in the British Pavilion, Hall 2.2.

A full-size working jack will form the centrepiece of Mechan's display and demonstrate its innovative Megalink controller. This patented system allows an unlimited number of units to be linked together and raised in perfect synchronicity by just one operator, using a remote full-colour touchscreen that displays important data about maintenance and servicing.

Mechan's jacks are suitable for all types of rail vehicle, including longer high-speed trains and heavy on-track plant. By broadcasting the theoretical position of every unit in a chain at regular intervals, Megalink enables each one to make speed adjustments so precise they are undetectable to the naked eye, correcting any height deviations. Richard Carr, Mechan's Chief Executive, said: "Our jacks are a distinctive sight when they are lined up together in rail depots and the gigantic yellow structure is sure to grab the attention of passers-by at InnoTrans. We are regular exhibitors within the British Pavilion and relish the opportunity to fly the flag for high-quality UK engineering."

The firm also offers a wide range of under-car equipment, underfloor lifting systems, rail traversers, bogie handling and storage, bogie presses and equipment drops.

Under-car lifting systems – sometimes known as engine removal tables – are designed to work specifically with Mechan's jacks in depots with flat floors. They comprise a powered lift table that travels laterally underneath the raised vehicle, then rises to engage with the engine raft. Although they have a low closed height, under-car systems lift to two metres and can be designed to suit various locations and applications.

Thanks to Mechan's specialist engineers, underfloor lifting equipment can be created to raise complete trains or single rail cars, reducing the time it takes to service components beneath the carriage. Cantilevered systems that allow bogies to be moved below the raised train can be built for workshops where space is restricted and column designs enable complete bogies to be replaced directly behind the lifting equipment. In both cases, the apparatus is stored below ground ensuring the depot remains unobstructed whilst work is carried out.

Traversers are a perfect example of large-scale installations that are built to order and Mechan is making a name for itself in this field. Demand for these unique machines is much lower than other depot equipment, but the firm is one of the few companies able to showcase its ability to design and build cost effective bespoke products for any size or weight vehicle, having produced the largest traverser in the UK for

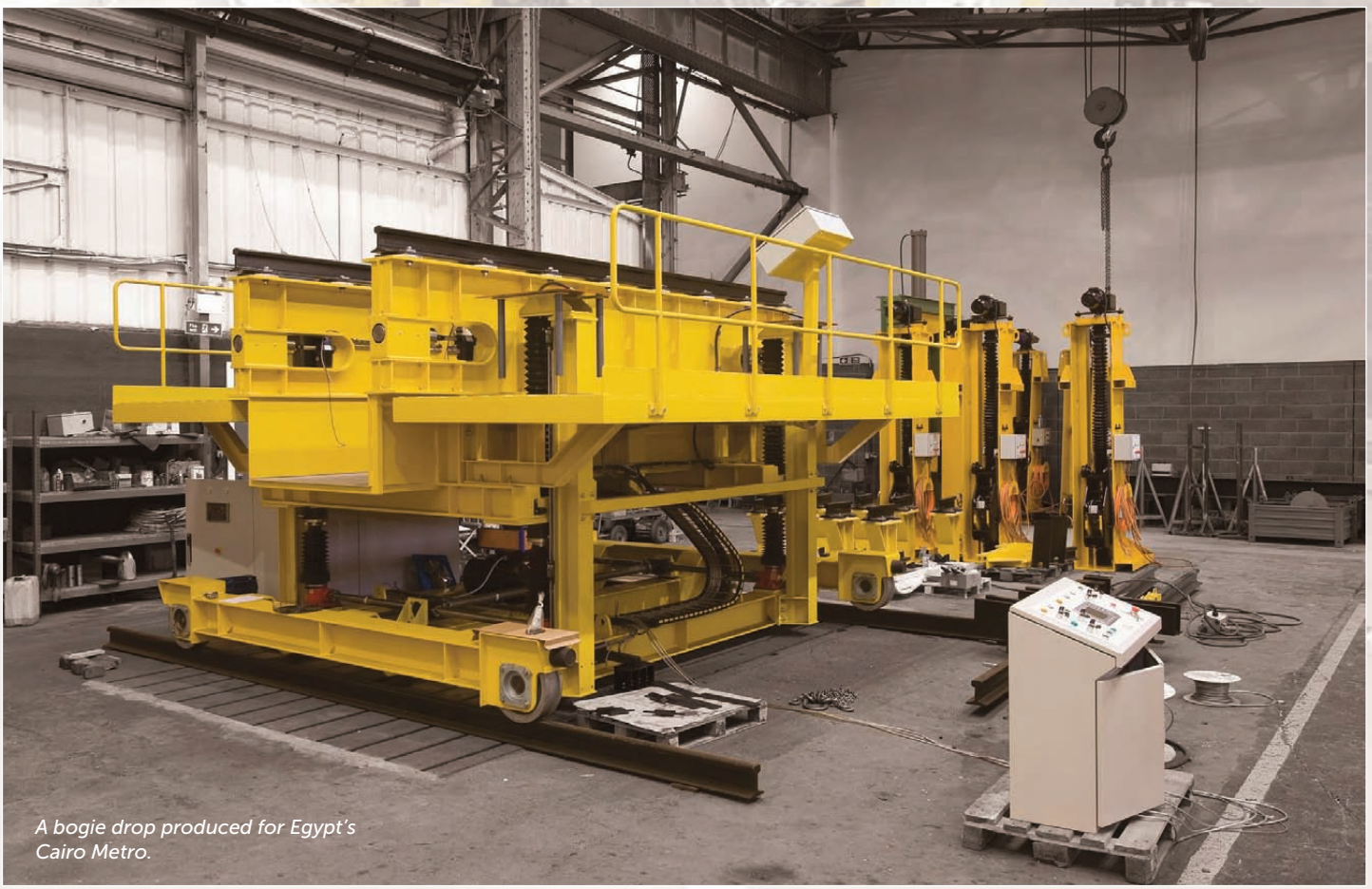
the Port of Felixstowe, with a capacity of 170 tonnes.

The term 'bogie handling' covers a wide range of products that make the removal, refurbishment and maintenance of bogies safer and more efficient. Some of Mechan's most popular lines include turntables that transfer bogies between roads, lifters to raise a bogie frame to a comfortable working height and their more sophisticated counterparts, lifting platforms, that are embedded in the workshop floor. This means that nothing but flat plates and a pair of rails are visible when they are not in use, allowing depot equipment to pass over without hindrance.

Bogie frame rotators can also be supplied to provide access to all areas of a bogie in an ergonomic and safe manner. Two jacks are fitted with rotating faceplates – the master is fixed to the floor and houses a single panel controller, whilst the slave is mounted on guide rails to enable the bogie frame to fit between the two units.

Mechana's jacks in action at Alstom's Longsight depot in Manchester.

When space is at a premium, bogie storage is essential. Mechan offers a range of low and high-level stands and stacking frames for stowing spare bogies securely and efficiently. By supporting the wheel treads, stands protect flanges and paintwork and can be left freestanding or bolted to the


A bogie drop produced for Egypt's Cairo Metro.

floor. One-piece stacking frames are supplied with self-locating plates for safe storage and lifting eyes suitable for raising a complete bogie.

Following build, repair or refurbishment, a bogie press is required to ensure the ride height is set correctly by mimicking the rail vehicle. The electrically powered unit bridges the rails and applies load to suspension points. Each press is made to order and for better performance, Mechan usually advises clients to fit a spreader beam that runs under the rails and transfers the bogie's weight to the press structure. Adapters and a range of optional extras can also be added to accommodate different types of bogie.

Mechana's bogie frame rotators in use.

As maintenance times come under increasing scrutiny, equipment drops are a popular addition to new and upgraded depots, allowing a complete bogie or under carriage equipment to be removed or replaced without decoupling vehicles. This makes bogie change feasible within two hours and can save valuable time on other underfloor work.

Mechan offers bogie drops with the traditional scissor action or its intelligent screw jack system, which is favoured by depot operators for its greatly reduced pit depth. A pit continuation and side platforms can be installed to give unrivalled access to the item being changed and rail beams are fitted that latch into place when the drop is not in use, to ensure the road is safe for depot traffic.

A bogie press produced for Unipart Rail

By continuing to deliver durable, cutting-edge equipment, combined with great service, Mechan is attracting new business on a global scale. Richard concluded: "We are really looking forward to catching up with colleagues old and new at InnoTrans. Recent success at home and overseas has enabled us to invest in our best-ever display that will emphasise the breadth of our product portfolio and highlight our expertise."

For more information about Mechan's depot maintenance equipment, speak to its sales team at InnoTrans, telephone **+44 (0)114 257 0563**, visit **www.mechan.co.uk** or follow the firm on Twitter, **@mechanuk**.

FIBERLINE COMPOSITES
CREATE MORE WITH LESS

Hybrid bridges: a competitive alternative

There is a growing awareness of the multiple benefits of GRP composite, and one application where GRP can make a decisive difference is as a surfacing material for pedestrian and cycle bridges – often crossing railways.

The GRP can be customised to the bridge specifications required – in terms of strength, rigidity and weight.

A hybrid solution combining wood, steel and GRP composite provides a competitive alternative to conventional concrete and steel structures. So competitive that international consultants at NIRAS declared GRP to be the 'X factor' in a recent project where Danish Fiberline Composites was a supplier.

Two cycle bridges

In October 2015 a cycle path incorporating two bridges was opened in Middelfart in central Denmark. Supplied by Danske Woodways, both bridges consist of a hardwood substructure supporting a black-painted bridge deck made of Fiberline Heavy-Duty (HD) plank. Among other things, the elasticity of the GRP composite enabled the bridges to be provided with transverse drains. Both bridges were assembled on site in just a few hours. The HD planks from Fiberline are prefabricated elements which are lightweight and can easily be lifted into place and machined on site.

Pedestrian and cycle bridge over Copenhagen Station

The existing concrete bridge crossing the railway at Copenhagen's Husum Station needed to be demolished for safety reasons. The contract for a replacement bridge was awarded to NIRAS, with installation causing minimal disruption to train traffic. The project called for a bridge that was both strong and lightweight and could also be assembled quickly. In this case the solution chosen was an FBD 300 (Fiberline Bridge Deck) made of GRP composite with a steel substructure resting on the existing concrete foundation. HSM Stålindustri built the bridge, which in addition to being lightweight also saves maintenance expenditure as GRP composite does not crumble, rot or corrode.

Breakthrough for hybrid bridges

Besides the cases described above, GRP decks from Fiberline have in recent months also been chosen for other bridge projects in Denmark: a cycle bridge in Haderslev, a dual pedestrian and cycle bridge for Femern A/S in the port of Rødby, and both an inspection bridge and road bridge in Vejen.

Fiberline's Technical Solution Manager, Christian Scholze, explains that hybrid solutions are a popular choice for small bridges where light weight, minimal maintenance and fast installation are required:

"With a hybrid bridge you get an extremely attractive solution that unites the best qualities in each material at a competitive overall price. For example, you can take the rigidity of steel or wood and combine it with the durability of GRP composite. This is the solution we see frequently. Fiberline supplies a corrosion and maintenance-free deck made of GRP composite that provides a watertight surface and protects the substructure, whether it's made of wood or steel."

Paramount advantages when using composite

Fiberline Composite's GRP material has extraordinary abilities when used for infrastructure. Besides the hybrid bridges, we manufacture a railing system and gratings that can be installed quickly and easily as it has an almost non-existing possession time. The lightweight structure requires no cranes and the expenditures on installation are therefore minimal. Most importantly, railings and gratings from Fiberline are nonconductive – a paramount feature for construction materials used near railroads and rails.

FACT BOX

Fiberline Composites A/S is one of the world's leading suppliers of pultruded GRP profiles for the construction industry. For more than 30 years we have manufactured durable solutions for construction purposes all over Europe. Our focus is quality, efficiency, and a high degree of technical innovation.

Fiberline GRP profiles have an evident success record within the construction industry due to the combination of high strength, low weight, and corrosion resistance. Therefore, the profiles form an excellent and cost-efficient alternative to more traditional materials such as wood, steel and aluminium.

2014 Fiberline became the first and only manufacturer of pultruded GRP profiles in the world to be granted Germany's prestigious approval "Allgemeine Bauaufsichtliche Zulassung" (abZ) for its programme of structural profiles. In the wake of the abZ approval we also succeeded in obtaining a coveted approval by the German railway union, Eisenbahn-Bundesamt (EBA). This means that our structural profiles can enter into all construction works initiated by Deutsche Bahn. Fibreglass composite features a number of unique advantages which make it a suitable construction material in connection with railways. The light, strong and corrosion-resistant material, which is electrically insulating, is well suited for railway bridges, platforms, canopies, and many other applications. The EBA approval is therefore an important milestone for Fiberline in its efforts to become a major supplier to the German railway sector.

From our modern headquarters in Denmark we constantly push the boundaries of GRP material in order to meet the requirements of a modern, energy conscious society.

Visit us at Innotrans, Berlin 20-23 September 2016 Hall 5.2 / 110

No corrosion
No conductivity
No worries

We supply long lasting cost effective composite solutions for the railway industry

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Middelfart, Danemark
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IMA DRESDEN
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GFK-Bauprodukt nach DIBt-Grundsätzen

FIBERLINE COMPOSITES
Middelfart, Danemark
Typzulassung
21.53-21 izbia/18-2101#003-(005/13-Zul)
Eisenbahn-Bundesamt

Fibreglass composite (GFRP) features a number of unique advantages which make it a valuable construction material within the railway industry. The light, strong, and corrosion-resistant material, which is also electrically non-conductive and requires very limited maintenance, is well suited for railway bridges, platforms, canopies, and many other similar constructions.

At Fiberline we supply long lasting, cost effective composite solutions for the railway industry.

Contact us on +45 70 13 77 13
or learn more on fiberline.com

GRP gratings for decking and GRP profiles for hand rail concept

FIBERLINE COMPOSITES
CREATE MORE WITH LESS

TRACK MORE WITH LESS

FRAUSCHER SENSOR TECHNOLOGY

WORLD PREMIERE
AT INNOTRANS 2016

THE NEW GENERATION OF LIVE TRACKING

Frauscher Tracking Solutions FTS:
Track and monitor trains, personnel and assets in real time by using one single solution – on and near your tracks.

Frauscher launches this new product line FTS which is based on Distributed Acoustic Sensing. The integration of this exciting technology with well proven axle counters and wheel sensors offers a wide range of applications. Thus FTS will significantly improve the way of tracking unlike any existing technology.

Experience the future:
InnoTrans 2016
Hall 25 | Stand 232
20-23 September 2016 | Berlin

www.frauscher.com/innotrans

Frauscher: New generation of live tracking

From 20 to 23 September Frauscher Sensor Technology will participate in InnoTrans in Berlin for the seventh consecutive time.

True to the motto "The new generation of live tracking", visitors will be introduced to the latest innovative functions of the established axle counter Frauscher Advanced Counter FAdC as well as to the brand new product line Frauscher Tracking Solutions FTS.

Track more with less

Generating more relevant information with less effort: Frauscher Sensor Technology makes it simpler for system integrators as well as railway operators to obtain the important information they need to operate, protect, manage and monitor their operational network. This approach is affirmed by the company's new claim "track more with less" and contributes to the latest developments of the Austrian company.

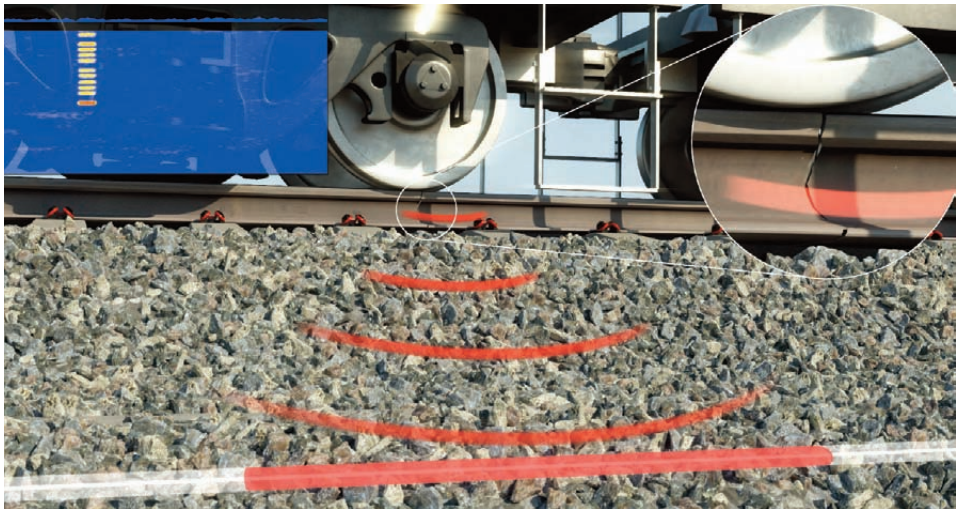
World premiere: Frauscher Tracking Solutions FTS

Positive and encouraging results of evaluating the use of fibre optic technologies, such as Distributed Acoustic Sensing (DAS), within the wheel detection and train tracking industry, have convinced Frauscher to develop this new product line, called Frauscher Tracking Solutions FTS. "This exciting and proven technology opens up a wide range of applications with the capability to track trains, monitor asset condition, secure infrastructure and protect personnel in real time using one single solution. Integrating Distributed Acoustic Sensing with well-proven railway technologies such as axle counters or wheel detection systems significantly improves the way trains are tracked unlike any other existing technology and will lead to a revolution in railway operation," explains Michael Thiel, CEO Frauscher Sensor Technology.

New tools for Frauscher Advanced Counter FAdC ®

The new Frauscher Alarming and Maintenance System FAMS offers operators a compact solution to monitor all their Frauscher axle counter components at a glance. Diagnostic information generated by one or more Frauscher Diagnostic Systems FDS can be managed via this interface which enables detailed planning of preventative as well as regular maintenance tasks. As a result the FAMS can contribute to a significant increase of cost efficiency of train operations.

System integrators can speed up



configuration of components in their projects by using the new Frauscher Configuration Tool FCT. This software contains support concepts for different experienced user groups and allows an intuitive usage for beginners as well as fast and direct configuration for experienced users. It provides immediate live information during configuration processes, in case an error occurs. For double-checking the configuration, an overview table can be displayed instead of individual text files. Additionally the software allows saving and re-using project templates for common system layouts. As a result, the FCT will facilitate significant savings throughout the configuration phase of a project by reducing working times during the commissioning of a system to a minimum.

The new Frauscher Alarming and Maintenance Systems FAMS and Configuration Tool FCT will complement the existing tool environment of the Frauscher Advanced Counter, consisting of innovations such as the Frauscher Diagnostic System FDS, the Advanced Service Display ASD or the Adjustment and Maintenance Box AMB. All these tools and features contribute to the company's principle of making it simpler for railway experts to get, transmit, sort and use all information they need from their systems – in line with the motto "track more with less".

Frauscher at InnoTrans 2016

20–23 September | Berlin
Hall 25 | Stand 232

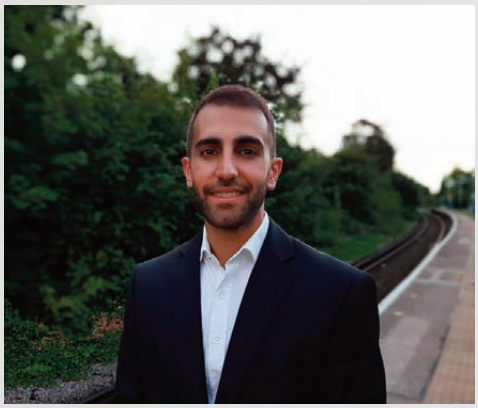
London's Cubic Innovation Centre – Solutions for the Future

Railway-News speaks with Niosha Kayhani

By Josephine Cordero Sapién

I first became acquainted with Cubic when I attended the HackTrain Conference earlier this year. I got chatting with Niosha over lunch and made a mental note to myself that I definitely wanted to find out more.

Cubic Transportation Systems only recently opened its Innovation Centre in late 2015 as a place to develop future technologies for the transport sector alongside start-ups and academia. As such, it's perfectly situated in Farringdon, London's tech hub centre, from where Cubic can work with customers, industry experts and top universities on transport solutions.



Sir Peter Hendy, Chairman of

Network Rail and former Commissioner of TfL backed the Innovation Centre, certain in the knowledge that technology is vital for our transport network and rail in particular to meet the challenges of the 21st century.

Niosha, can you tell me a little bit about yourself and how you came to work at Cubic's Innovation Centre?

Born and raised in Sweden before crossing the waters to the UK; my engineering experience is broad, having studied within the field for over 7 years. I worked with fire detection systems, audio software, fibre-optic laser systems and my penultimate venture was at Google in their European HQ in Dublin, Ireland, but this was not engineering related (except a short-term assignment on one of their 'X' projects). Meanwhile and very fittingly, I came across an interesting project and role: research and development into the future of ticket detection with a mission to double the throughput of existing revenue protection infrastructure (gatelines) to meet the predicted increased volumes of rail travellers. Later referred to as 'Gateless Gatelines'. The project sounded exciting and full of opportunities to apply engineering concepts to and once I spoke to the team and visited the Innovation Centre in London; I felt excited and keen to begin the work.

Tell me about the Innovation Centre. What's the working environment like and what kind of rail industry projects are you working on?

Cubic's Innovation Centre is a place where Cubic, its partners and customers can come together to research, build prototypes, hack, and draw ideas with the aim to create new business opportunities for Cubic in current and new markets.

We are fuelling Cubic's innovation and product pipeline whilst extending and protecting our intellectual property. We partner with world-leading universities to shape the future of mobility and we utilise world-class technologies to improve transportation systems' efficiency, security and reliability.

The rail industry related projects we are currently working on are 'Gateless Gatelines' (mentioned above), incorporating new and amalgamated methods of ticketing, end-to-end passenger experience, mobility as a service, transport mobile applications to improve user experience, to name a few.

Our Innovation Centre is nimble and its members have diverse skills and areas of expertise. When combined, we have the right ingredients for successful innovations to take place.

Gateless Gatelines implies that you are looking at getting rid of the barriers while still ensuring that passengers have tickets. What solutions here are you investigating? Any that seem the most promising to you?

Precisely. To design a 'gateless' system that can ensure revenue protection is not compromised requires the detection of passengers to be quick and accurate. To achieve this we are investigating new types of travel tokens. This does not mean we are neglecting the current ticketing media, we are in fact including current travel tokens as well as researching potential future travel tokens all centred around account-based solutions for a seamless ticketing and payment experience for passengers.

Was Cubic tasked by a client to develop such Gateless Gatelines - and Cubic then accepted the challenge - or does Cubic itself identify areas where more innovation and technology could benefit industries, in this case the rail industry, and then strives to develop solutions and bring them to market? In essence, who identifies the projects to begin with?

Short answer; we do both. Gateless Gatelines was Cubic's (and its partners) submission for the Future Railway competition under the theme of 'Future Ticket Detection'. Cubic identified this innovation project but the theme

was set by the client.

We do work the other way around as well; we research and develop ideas based on technological advances or needs we have identified ourselves, and then bring them to the table for potential customers. Cubic has an internal innovation platform where employees are encouraged to submit conceptual ideas that have the potential to get research funding, ranging from incremental changes which can take weeks, to larger-scale, strategic projects that can take over a year to implement – there is no limitation to the submissions! This platform creates another valuable source of projects that feed into Cubic's innovation pipeline.

We also regularly look to partner with companies and universities to bring in a diverse mix of people, ideas and expertise into the projects. These partnerships are not always driven by Cubic; we have many instances where companies and universities approach us with project proposals where we provide our domain expertise to solve exciting challenges.

You mention the Future Railway competition. How often do you enter competitions like that and what do you get out of them beyond presenting your ideas?

We regularly enter these types of competitions and as mentioned before, we also get approached to be part of other consortia entering competitions. The work we do is broad and covers a great deal of the end-to-end passenger experience for public transport; which allows Cubic to enter solutions in various domains such as 'safety and security' to 'disruption management' to 'seamless ticketing' and so forth. What we achieve from entering these competitions is the thorough thinking with our partners to solve a specific problem. It means that if the competition entry is not successful, that we have the right framework and positive momentum to take it forward regardless.

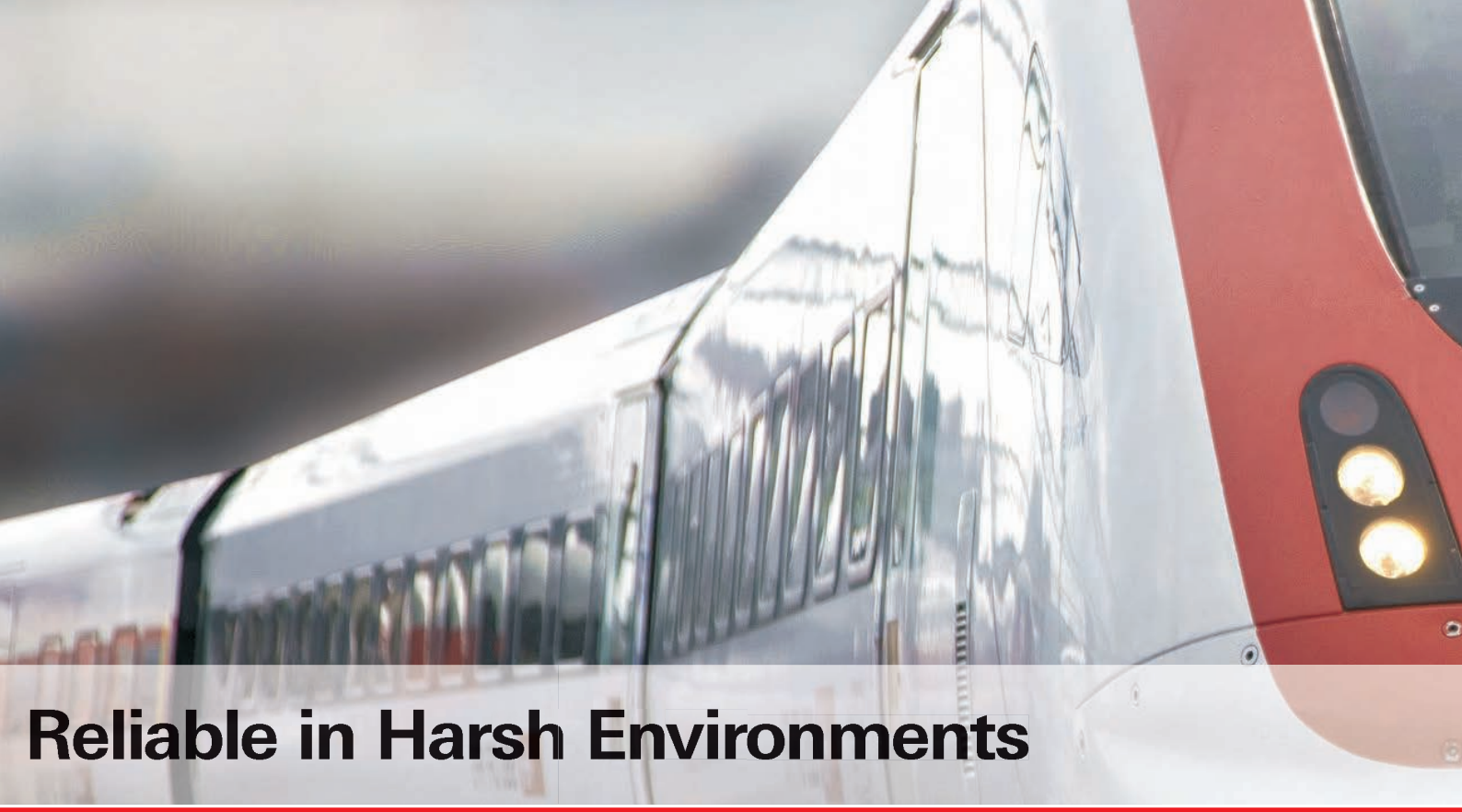
With regard to Cubic's other activities with regards to the rail industry, can you tell me about some of the ideas that are submitted? For example, if I'm a rail passenger, what might I encounter where Cubic has contributed to my journey being better?

For a rail passenger, we are specifically aiming at removing congestion on station platforms, providing more visual and real-time data about on-coming trains, creating user-centric transportation apps, as well as enabling passengers to use a single account for multi-modal travel transactions (Cubic's OneAccount).

We believe that by providing high-quality, real-time and integrated data across all modes of public transport that people will be empowered to make smarter and more informed decisions about their journeys, which all ties into building smarter cities of the future. These ideas are part of Cubic's NextCity philosophy.

What's the next Cubic innovation that's going to be implemented in the rail sector?

Inserts cliff-hanger One of the aforementioned – stay tuned!



Reliable in Harsh Environments

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Railway*line*

Industrial connectors




Electrical Connector Systems for Rolling Stock

Modular Power Connector MPC
The compact and modular system has been designed to carry out the connections between several functions of the electrical chain of traction as well as the power connection between the cars.

The Modular CombiTac System
CombiTac allows customized combinations of different contact types for countless applications. The new rackable version CT-HE is particularly suited for slide-in systems and fulfils the railway standards for operating temperature, shock, vibration and fire protection.

Multipole Connector for Harsh Environments
The Powerline connector in its sturdy cast aluminum housing provides a reliable technical solution for the electrical connection between railway carriages, ensuring excellent performance and safety.

Connectors for Busbars
Where there are inverters in railway vehicles, busbars are used to distribute the high currents. Connectors in the CLIPLAM CL-T and GSR Fork plugs ranges are a superior solution for connecting busbars in every respect, no drilling or screwing required.

Visit us:
InnoTrans: September 20 – 23, 2016, Berlin, Germany, Hall 12, Booth 208
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Advanced Contact Technology

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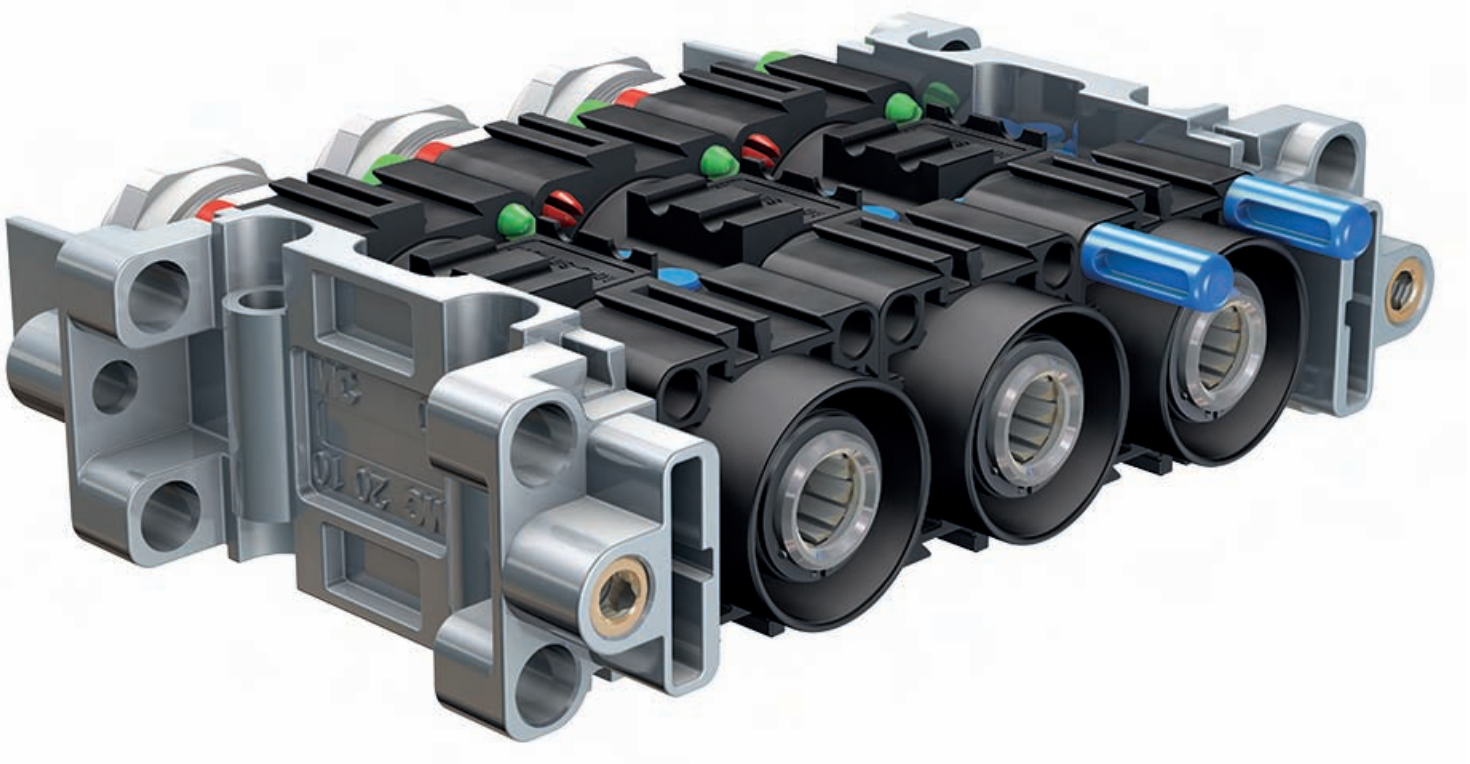
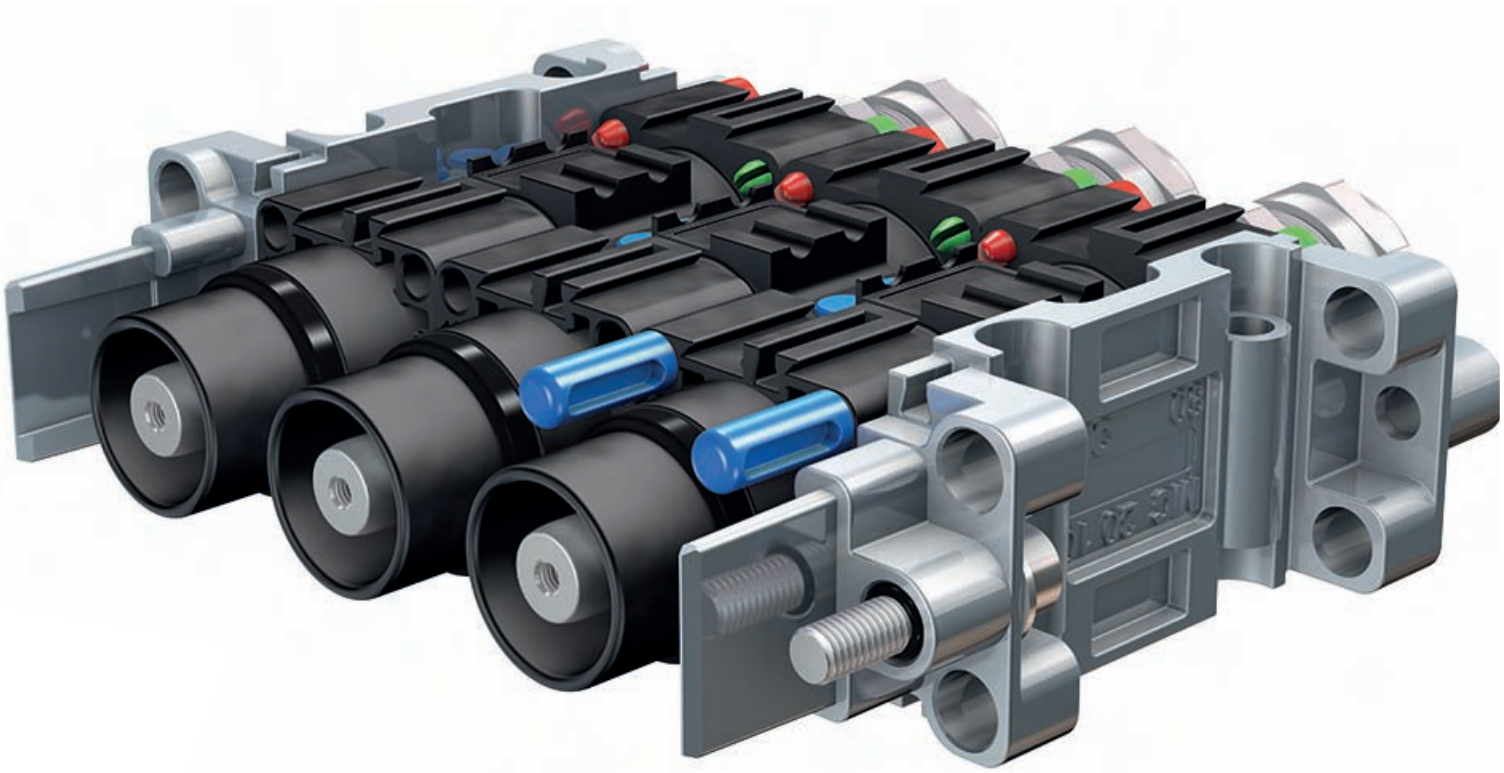
Multi-Contact: System Solutions for the Rail Industry

The Swiss connector specialist will present connection solutions at the leading transport engineering trade fair.





At InnoTrans 2016 in Berlin, Multi-Contact (MC) will be presenting a selection of connectors and tailored connection solutions, including systems that have been especially designed for the rail industry, such as the Modular Power Connector (MPC). Thanks to its simultaneously compact and modular design, the MPC series is ideal for a variety of rail applications, for example connections for intercar couplings, external connections for a range of sub-systems (components, devices) and connections for electrical traction motors. The connector with nominal values of maximum 3600 V and up to 700 A is available with the highest-level IP69 protection and also with shielding. The MPC meets the requirements of fire safety standard EN 45545-2.

The CT-HE connector is an adaptable, versatile superstar from the CombiTac family. With power contacts and optional signal contacts, it is suitable for battery modules in slide-in systems with over 100,000 mating cycles, as well as for use in battery monitoring systems. Another area of application is connection solutions for drive motors, where compact power modules can be installed in a variety of housing types.

The CombiTac system allows for modules with signal, data bus, fiber optic, co-axial, and power contacts up to 300 A or 5 kV, as well as thermo-elements and compressed-air couplings, to be combined within a compact system. This versatility makes CombiTac the optimal system for testing applications, for example for on-board and passenger-information systems. The new 10-Gbit CombiTac module for Ethernet communication complies with the requirements of CAT6A and the EN 45545-1 rail standard. As with all MC connectors, CombiTac is available pre-assembled or as fully tested modules from a single source. MC fork plugs and flat contacts for high-current and busbar applications are yet another highlight. In collaboration with a manufacturer of traction converters, MC created an elegant solution for printed circuit board units. The fork plug was designed based on customer requirements, is lightweight, saves space in inverters, and can be used in temperatures ranging from –55°C to +125°C. Assemblies equipped with fork plugs can be changed quickly and reliably, without any special tools. The contacts are vibration-resistant and meet the

strict requirements of the rail industry.

Reliable grounding systems such as the EGH electric grounding hinge, the world's first switchgear cabinet hinge with a built-in ground connection, or customer-specific grounding solutions for rail vehicles are extremely important for rail technology.

All of the connection solutions being presented are based on MC's proven MULTILAM technology. They offer low contact resistance with minimal power loss and low heat generation, as well as lasting vibration resistance, and all of this after hundreds of thousands of mating cycles.

Multi-Contact is a leading international manufacturer of electrical contacts and connector systems. The company was founded in Switzerland in 1962. Multi-Contact has been part of the Stäubli Group since 2002. Stäubli offers innovative mechatronic solutions in four segments: electrical connectors, fluid and gas connectors, robotics, and textile machinery. With a global workforce of over 4,500 employees, the Group has a presence spanning 25 countries, and a network of agents in over 50 countries.

Multi-Contact at InnoTrans: Hall 12, Stand 208 and Hall 10.2, Stand 201. Michel Schmitt, Multi-Contact Business Development Manager and rail technology specialist, and his team are looking forward to presenting the latest products and holding interesting discussions in Berlin.

BT Cables

A world leader in cable manufacturing

Our enhanced product range now has more applications for the rail market.

Whether it is safety critical infrastructure cables like AzLM axle counter cables or fixed telephone network telecoms cables to in-station cabling for ticketing machines, digital notice boards or CCTV cameras, BT Cables has a product to suit your needs

and remember

at BT Cables we passionately believe in these key messages

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- **Experience counts in cable sourcing**
- **You need a cable partner you can rely on**

Combined with the strength of BT Supply Chain we offer un-paralleled service and product solutions.

BT Cables – trust in our experience

BT Supply Chain - Rethink what your supply chain can deliver

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BT Cables keep trains moving

The rail industry has always required cables specific to its own unique requirements, whether these be for signalling, rolling stock, or infrastructure.

The rail industry has always required cables specific to its own unique requirements, whether these be for signalling, rolling stock, or infrastructure. The industry is concerned with the movement of people and goods, and this introduces safety concerns requiring cables to be designed and manufactured to the highest-possible standards. Railway operators have developed their own standards, for both general use and for very specific undertakings, of which the best example in Britain is the London Underground. Recently there have been an increasing number of European standards appearing to assist interoperability and standardisation across the European rail network.

BT Cables' range has a proven track record across numerous railway systems, and offers a wide choice of cable types, encompassing fire safety requirements inherent in modern rail systems where passenger and operability safety is critical.

Design and development

BT Cables is backed by a world-class design and development team to assist its rail customers in solving their problems. This facility is key to the service provided to the rail industry, allowing the joint development of new solutions to modern-day challenges, whilst retaining the ability to supply established products. This is underpinned by a specialist manufacturing unit with full control of the manufacturing process from start to finish.

Capacity

With parts of the railway close to capacity and demand for passenger and freight services increasing, continuing investment and smarter working methods are essential to build a bigger, better and even safer railway. Almost 1.7 billion journeys are now made on our railway every year, 34% more than just five years ago, and more than double the number of twenty years ago.

In the current control period (CP5) which runs between 2014 and 2019 Network Rail is upgrading the railway, investing more than £25bn to deliver more services and better journeys by lengthening platforms, untangling tracks, introducing electrification and building world-class stations.

Benefits

Throughout this programme of investment, Network Rail are focussed on four key benefits and every project delivers at least one of them:

1. Faster – reducing journey times by upgrading track layouts and signalling

2. Increased frequency – infrastructure improvements allow more trains to run every hour

3. Greener – electrifying lines to make train travel cleaner and greener: by increasing rail freight (which is 75% greener than road freight) they are removing lorries from our roads

4. More comfortable – lengthening platforms to allow longer trains with more seats, and modernising stations to make journeys more comfortable

By the end of 2019, Network Rail will have begun implementing the digitalised railway of the future and BT Cables is ready to play its part in this exciting future network.

Brexit

BT Cables is confident that its product and service portfolio will weather any Brexit storm as manufacturing from its headquarters in Manchester for the UK rail market will not be dependent on the outcome of any new trade deals that have to be negotiated in the post-Brexit era.

intreXis: DC-DC Converter 500W

The intreXis Boardnet Converter Platform is a new definition of high-performance DC-DC converters in the 500W class.

With its ultra-wide input voltage range of 14.4VDC–154VDC, 500W power and 96% efficiency, the new intreXis converter generation sets a new benchmark for DC-DC converters.

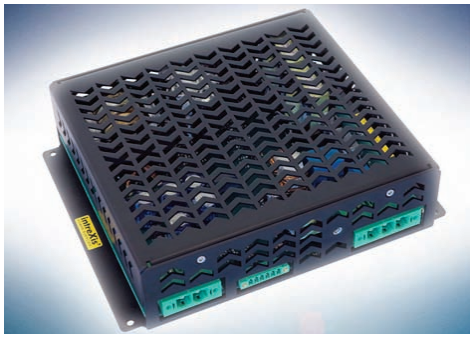
Limits redefined: This is what the intreXis engineers demonstrated impressively. The ultra-wide input voltage range allows the use of these DC-DC converters in railway applications with all nominal input voltages (24V, 36V, 48V, 72V, 110V) without changing the configuration. The full 500W power is available throughout the temperature range class TX from -40°C–85°C according to EN50155, without de-rating or a fan.

This is made possible by the outstanding efficiency of 96.2% at 110V operation and 92.5% at 24V operation. With the galvanic isolation of 3000VAC, the active inrush current limiter, the hold-up time of 10m/s and the extremely low weight of only 1.3kg, the new converters of the intreXis Boardnet Converter Platform are well equipped for the most demanding railway applications.

Flat battery start unit

intreXis AG has designed a new and innovative flat battery start unit which is powered by the contact-line. The design of the converter is based on an innovative concept with silicon-carbide Schottky-diodes (SiC).

High voltage power-supplies powered by the contact-line experience high-energy surges, which cannot be absorbed with traditional techniques like varistors or transzorbs. An innovative, active surge-limiter with outstanding advantages is implemented in the converter.



The unit has following outstanding features:

- Wide input voltage range: continuous operation from 400–1100VDC (wider than required by the EN50163-standard)
- High efficiency: 89–90% over the entire input-voltage range.
- Very low dissipation and low component stress during standby mode: < 1.5W @ 750VDC input voltage.
- Active surge-limiter withstands 3kV for 20ms and 4.5kV falling to 2.25kV for 1ms (according to UIC 550, more rugged than required by the EN50124-2 standard)
- Very low impact on the efficiency during normal operation (power dissipation approximately 1W @ Vin=750VDC and Pout=250W, 0.5W @ Vin=750VDC and Pout=0W)
- Ambient temperature class: Tx (-40°C to +85°C, according EN50155)
- Vibration and Shock according EN61373, cat.1, class B
- Partial discharge test according to EN50207
- Small and light design: weight of the unit only 1.2kg.

DC-DC Converter with a temperature range from -50°C to +85°C for Russian Railway

The railway standard EN50155 distinguishes the temperature classes T1 (-25°C to +70°C), T2 (-40°C to +70°C), T3 (-25°C to +85°C) and TX (-40°C to +85°C). However, in many regions of the world it can get colder than -40°C. For instance, in Russia temperatures down to -50°C are expected. intreXis has invested a lot in research for the proper functioning of the power supplies – and hence the whole locomotive – at these extreme temperatures: intreXis has designed a family of converters, which operate over the entire temperature range from -50°C to +85°C without any restrictions.

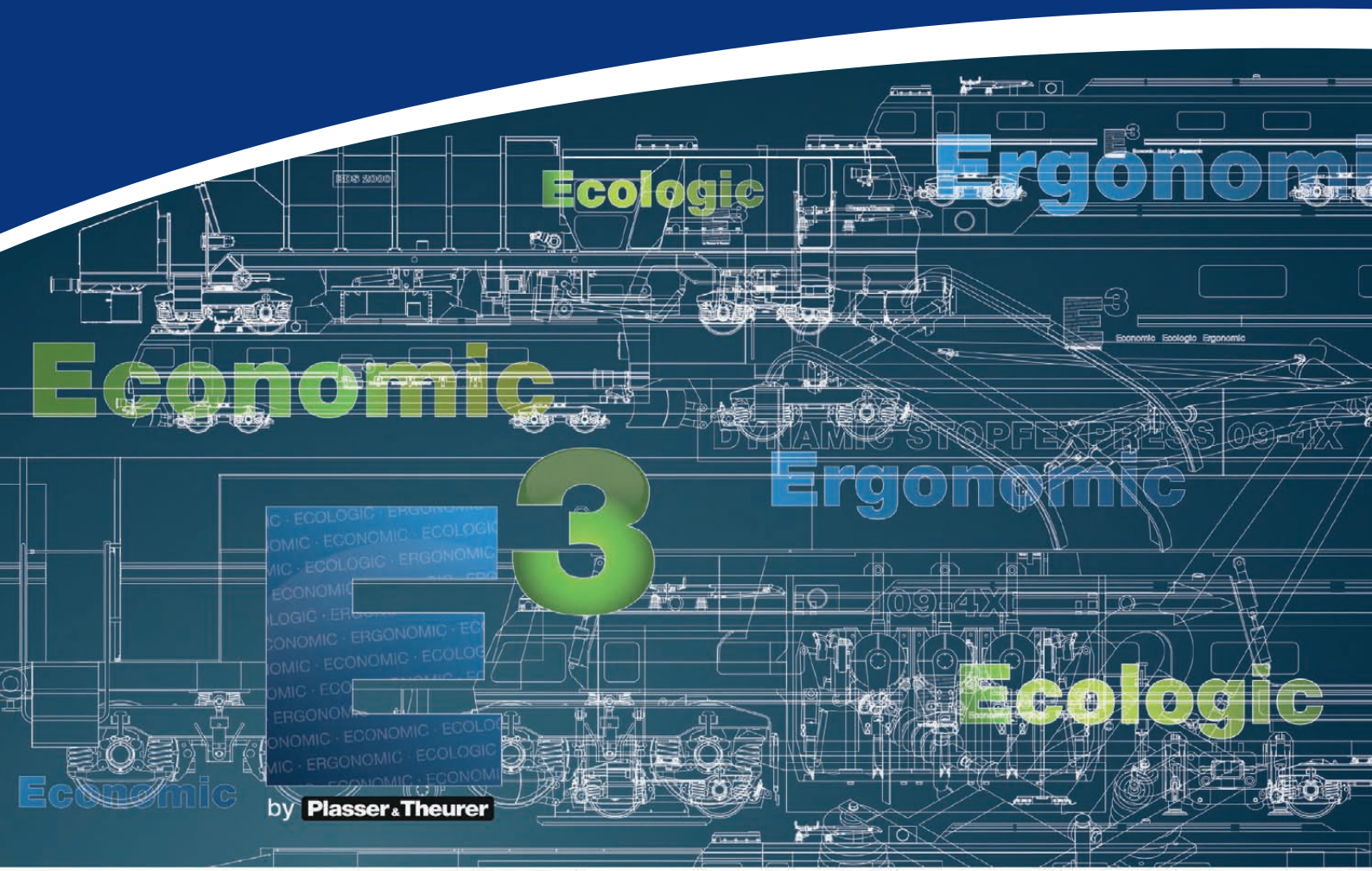
There are many challenges to operate a DC-DC converter at -50°C without any restrictions. Most manufacturers of electronic components for power supplies specify their function only down to -40°C. The market offers components which are specified for an operating temperature down to -50°C, but these components are substantially more costly and their availability is very limited. Moreover, the use -50°C components does not solve the problems which are inherent to component characteristics. For instance the equivalent series resistance (ESR) of electrolytic capacitors rises dramatically at very low temperatures. NTCs, which are often used for the inrush-current limitation, have very high impedance at extremely low temperatures. The gate-source threshold of FETs rises significantly at low temperatures. intreXis engineers have overcome and mastered all these challenges with success!

Are you also facing an imminent challenge to evaluate a power supply that can operate over a temperature range of -50 to +85°C?

Ask us – we are pleased to present you our solutions!

HIGH CAPACITY I PRECISION I RELIABILITY

Plasser & Theurer



E3 Economic Ecologic Ergonomic

The next step -

the machine with hybrid drive

Plasser & Theurer: Delivering power

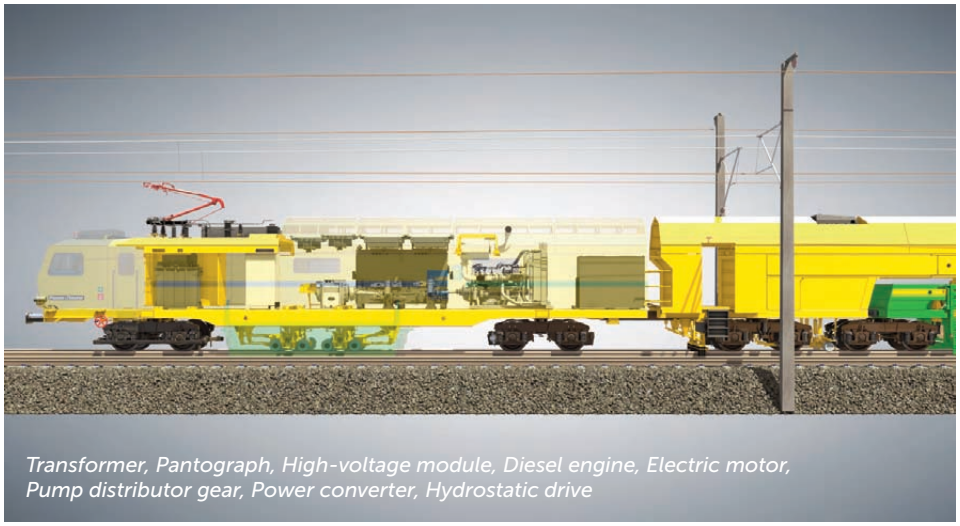
Our new drive concept allows the machine to be powered either via a diesel engine or via an electric motor using the electrical energy of the contact wire.

Our new drive concept allows the machine to be powered either via a diesel engine or via an electric motor using the electrical energy of the contact wire.

The next step – the hybrid machine

The EU climate goals 2030 comprise a comprehensive climate and energy package. Railway administrations such as Deutsche Bahn (German Railway) and Österreichische Bundesbahnen (Austrian Federal Railways) develop strategies for sustainable network management. We want to help our customers work cost-efficiently and act flexibly under these conditions.

The solution we are offering is a new drive concept: it allows the machine to be powered either via a diesel engine or via an electric motor using the electrical energy of the contact wire. This applies to both travelling and working. As a result, the local CO2 emissions are nearly zero and in connection with the extensive noise protection measures our customers are enabled to meet the ecological framework conditions for infrastructure maintenance.



Transformer, Pantograph, High-voltage module, Diesel engine, Electric motor, Pump distributor gear, Power converter, Hydrostatic drive

Cost-efficiency for the operator

Rising fuel prices, low work shift returns and high staff costs – they are the reality contractors have to face. The hybrid machine offers the operator numerous options to reduce the total costs over the long-term: whenever current can be collected from the overhead line, the diesel main engine will be switched off. As a result, fuel consumption and, consequently, time and cost-intensive refuelling are reduced. Moreover, a significant extension of the service

intervals due to the lower mileage of the diesel engine lowers the costs.

The hybrid drive car

The drive concept of the machine includes a diesel engine similar to those used so far, plus an additional electric motor for power supply via the overhead line. The electric components have been purchased from renowned manufacturers. We do not compromise on quality. The control system has been developed by Plasser & Theurer. This was pioneering work as this was the first track maintenance machine of this output category to be fitted with this drive system.

Economic

• benefits the procurement of awards thanks to ecobonus

• avoids eco penalties

• extends the range of applications in urban areas and tunnels

• lowers the costs of fuel and logistics

• reduces maintenance costs of the drive

Ecologic

• complies with stricter environmental protection requirements

• reduces pollutant emissions

• uses "green" traction current

• emits less noise

Ergonomic

• reduces noise pollution and exhaust emissions

• offers ergonomically optimised and attractive workplaces

More on this topic:
www.plassertheurer.com/aktuelltv-en

Quality of work remains unchanged: 4-sleeper tamping using the Plasser & Theurer tamping principle

The hybrid drive system E³

The machine is powered either via an electric motor or via a diesel engine. It is driven hydrostatically via one drive shaft each to the pump distributor gear which generates, as in other machines, the hydraulic pressure for all systems, from the drive to the work units.

Whenever current can be collected from the overhead line, the entire machine can be powered electrically both during work and transfer. When travelling through insulated sections, there is no need to stop the machine or to interrupt the work sequence. A fully automatic control sequence triggering the change of drive starts the diesel engine, regulates the smooth transition between electronic motor and diesel engine and then switches off the electric drive. As soon as the system notes that current can be collected again, it automatically switches back to electric drive.

The diesel engine assures operational availability in sections without overhead line

Main component of the new drive concept: the electric motor

Indirect braking system with energy recovery

The hybrid drive system enables a braking effect to be achieved due to the moment of the electric motor working as a generator during braking. The electricity generated can be fed back to the grid. If feeding the grid is not possible due to regulations of the railway administration, the energy can be reduced via a braking resistor mounted on the roof. Both scenarios lead to a longer service life of the brakes thanks to less wear.

The 09-4X Dynamic Tamping Express E³ and the BDS 2000 E³ in regular work site operation

Generator set for work breaks

To ensure ecological operation of the on-board network during standstill, a generator set with a separate diesel engine is mounted on the machine. It supplies the machine's electrical consumers such as lighting, ventilation, computer etc. with power when current collection from the overhead line is not possible.

Hybrid drive for three well-proven machines

The first two machines with hybrid drive, the 09-4X Dynamic Tamping Express E³ and the BDS 2000 E³, were put into operation by Franz Plasser Vermietung von Bahnbaumaschinen GmbH in early August 2015. The third machine, a universal turnout tamping machine, is manufactured for Krebs Gleisbau and will be operated in Switzerland for the first time.

Naturally, our work technology remains unchanged. Therefore, top quality continues to be offered – this time even with a smaller "ecological wheelprint". It goes without saying that all three machines are suited for line category C2.

The operating controls can be accessed more easily during tamping work

Tamping and ballast management – quiet please!

The electric drive in connection with the noise protection measures at the tamping and stabilising units of the 09-4X Dynamic Tamping Express E^3 reduces the noise emitted by the machine in operation to a minimum. The BDS 2000 E^3 has been designed to work as quietly as possible as well: the inside of the hopper and sweeper units have, for example, been fitted with sound protection mats.

New, ergonomic design of the cabins

All cabins have been redesigned both in terms of ergonomics and colour. The control system Plasser Intelligent Control makes it possible to control all functions via touchscreens offering clear menu guides. Only those operating controls that are needed continuously are incorporated in the armrests of the operator's seat.

Maintaining tracks and turnouts using the new drive concept
The drive unit of the Unimat 09-32/4S Dynamic E^3 is positioned in the middle of the machine. This machine will be supplied to Krebs Gleisbau as it has been awarded a contract of Schweizer Bundesbahn (Swiss Federal Railway) thanks to the new hybrid drive concept. This continuous action machine is suited for both maintenance of tracks and turnouts.

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The cockpit is more clearly arranged thanks to the new design

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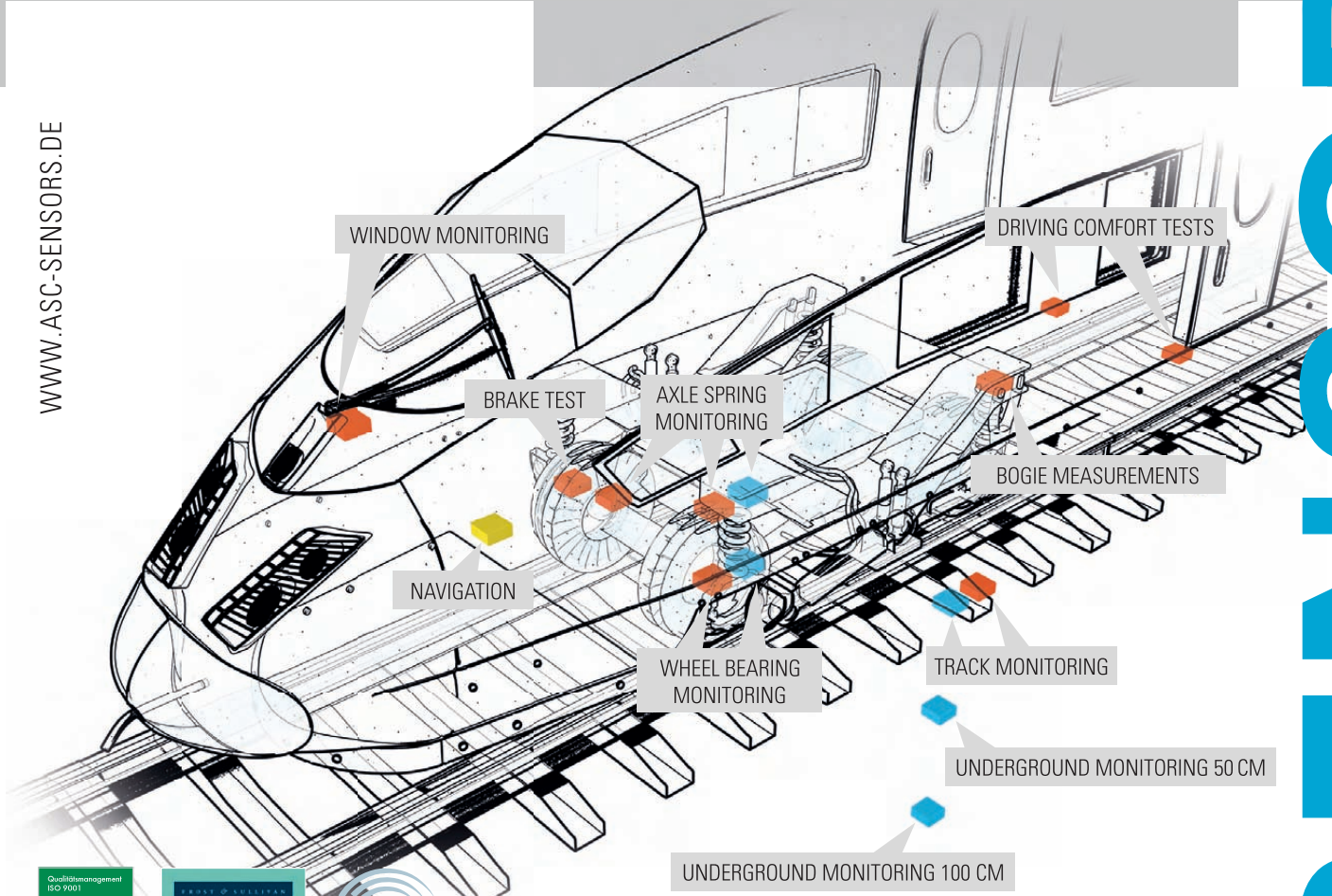

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CAPACITIVE ACCELEROMETERS

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Recyclable trains

The environmental performance of goods and services is now recognised as being essential for the overall performance of the transport sector.

By Véronique Andriès, Alstom

The environmental performance of goods and services is now recognised as being essential for the overall performance of the transport sector.

In the railway industry, energy and the efficiency of material resources have been identified as the two main levers for controlling and decreasing the environmental impact of transportation services. Energy consumption is estimated to account for 55 to 85% of the environmental footprint of a train over its lifecycle, while resources represented by materials and components could account for up to 45%.

Alstom believes that transport systems should be fluid, eco-friendly, safe, connected and accessible. The company is constantly working to enhance the environmental advantages of its solutions, for example through the deployment of its eco-design policy. Alstom is committed to reducing the environmental footprint of rail transport by developing efficient solutions in terms of energy and materials. The recyclability of rolling stock contributes significantly to material efficiency in the context of global raw material depletion. This is particularly true if the product in question is partially made from materials that have already been recycled, with a prevalence of scrap materials. Designed not only to be recyclable, but also to include recycled materials, Alstom's solutions do just that. In this respect, new trains can be regarded as contributors to the circular economy.

Old fleets: Already recyclable but....

The decommissioning and dismantling of existing train fleets provides very useful return on experience. For several years, Alstom has been gathering information through exchange with dismantlers and recyclers, and using the lessons learnt when designing new trains.

What happens when an old train reaches its end-of-life? The first

task is to drain the fluids, such as the oils and refrigerants, and to dismantle – with caution – certain components of the train, such as the batteries. Other components are then dismantled or retrieved from the train by cutting. Finally, what is left of the train goes through cutting and shredding, and the fractions are sorted and sent to the recycling industry.

The first lesson learnt is that the presence of potentially hazardous materials complicates end-of-life management, generating additional depollution steps that are both complex and costly,

heavily influencing the business model. For example, many of the train fleets being dismantled today include asbestos-containing materials. While their presence does not represent a health concern during the operation of the train because the asbestos is embedded in other materials, an additional step is required during dismantling. This step accounts for nearly half of the duration of the total dismantling operation. The second lesson learnt is that the recyclability of materials depends very much on the maturity and efficiency of recycling processes. The materials that benefit from the highest recyclability rate today are metals. Old trains, which contain large amounts of metals (steel, aluminium, copper, brass, etc.), are more than 90% recoverable. The third lesson learnt is that the compatibility of materials used in assembly, and the assembly process itself, is essential for orienting components directly into the recycling process, thus avoiding material losses. For instance, gluing should only be used to assemble materials that are compatible for recycling. Floor coverings should not be glued onto a wooden floor, for example. Alstom enhances the recyclability of new trains: how?

By applying a strict hazardous substance limitation strategy

In compliance with our strong commitment to protecting human health and the environment, and in line with our environment, health & safety and eco-design policies, we use environmentally friendly materials for the design and manufacture of our products. Strictly limiting the use of hazardous substances in our products is one of the solutions chosen to limit the negative impact of materials and components used for rolling stock, signalling systems and spare parts.

For many years, the objective of these stringent processes has been to:

■ reduce the amounts of hazardous substances used in our production sites and in our products

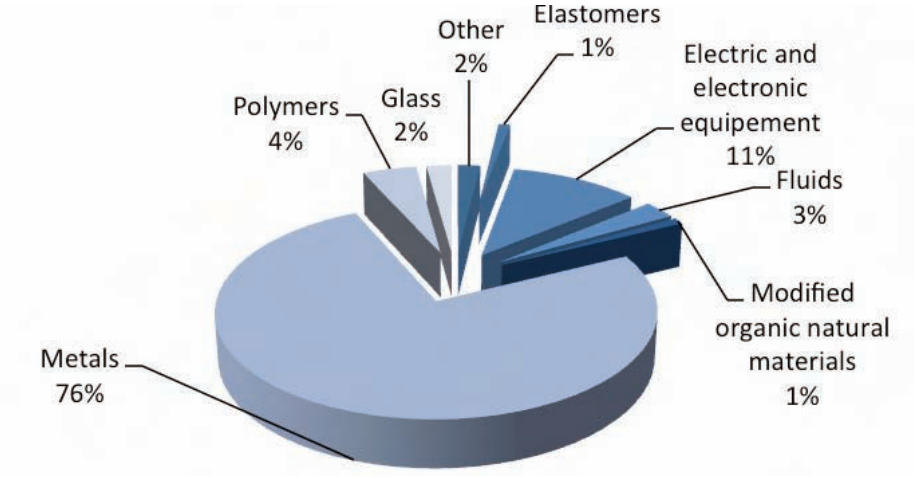
■ reduce the environmental and sanitary impact of our activities and products over their life cycle

■ anticipate technical and industrial hurdles related to the application of regulations such as REACH

Gradually substituting a substance of high concern is a means of:

- avoiding its production and the related risks
- avoiding its use in our factories or at our suppliers' sites
- avoiding any leakage or emissions either into the ground or the air breathed by passengers and rolling stock operators
- avoiding emissions during incineration when the component containing the substance becomes a waste product
- avoiding additional costs during end-of-life processing
- recycling material

By using recyclable materials: Alstom selects recyclable materials for the design of its trains. The figure below shows a train's typical material content.



Train material content

While current train solutions are still largely based on metals, there is an increasing trend to include plastics and composites that are not always recyclable. As far as possible, Alstom selects its non-metallic ratio from a panel of recyclable plastics.

Materials used for thermal and acoustic insulation also represent an issue for end-of-life. Mineral wools such as rockwool are not recyclable. Alstom avoids its use, proposing instead insulation solutions that are 100 % recyclable.

Textiles are still very difficult to recycle and instead can be burnt using energy recovery.

Avoiding incompatibility and permanent assembly... Providing information on systems material composition and guidance for dismantling.

During the design phase, Alstom avoids mixing "non-compatible" materials, especially if their separation after cutting, shredding and grinding is difficult, as it is for non-compatible plastics such as polypropylene (PP) and polyethylene terephthalate (PET).

In these cases, the corresponding fraction has to be burnt instead of being recycled.

A final important provision to optimise dismantling and provide the best recycling routing is to produce guidance for the end of life of trains, providing information:

- on parts and components that should be drained or "dismantled" with caution and routed to special reclaiming industries
- on parts and components that should be dismantled before direct routing to the recycling industry

- on materials used for the different parts and sub-systems and their dismantling process
Some examples

Alstom's Coradia Polyvalent offers a second life for waste, containing more than 32 tonnes of recycled materials. The train is 93.3% recyclable and 98.5% recoverable. Even taking its 40-year-plus lifetime into consideration, if current recycling practices are applied, for a 152-tonne train, 66.3 tonnes would be dismantled and sent directly to recycling. The rest would be cut, shredded and ground before the sorting of different material fractions for recycling, burning or waste disposal.

Examples of reducing the environmental footprint of our solutions

A new type of metro for the Paris network (MP14)
Recoverability rate: 98%
Recyclability rate: 95%

A new type of metro for the Paris network (MP14)
Recoverability rate: 98%
Recyclability rate: 95%

Citadis trams
Recoverability rate: 98%
Recyclability rate: 92%

TGV Euroduplex
Recoverability rate: 97–98%

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DAN DRYER hygiene equipment

For rolling stock and station buildings

Build-in hand dryer

Build-in hand dryer

Baby changing station

Recirculation air heater

A close dialogue-based cooperation with our customers is key to the development of customised solutions for the railway industry. With this collaborative approach DAN DRYER has successfully developed build-in hand dryers, baby changing stations and recirculation heaters for a large number of railway projects across Europe.

In addition, DAN DRYER offers a wide selection of other toilet equipment such as waste bins, toilet paper dispensers and soap dispensers, making us able to deliver complete hygiene solutions for installation both on board rolling stock and in station buildings.

A major DAN DRYER objective is to be at the forefront of technology. – Living up to the specification requirements of the future. Through this vision, DAN DRYER has earned a unique position as a niche manufacturer of primarily build-in hand dryers for integration in railway vehicles.

Select projects with DAN DRYER railway equipment:

- **TGV Atlantique, Lacroix**
- **TGV Sud-Est, RISE-refurb**
- **Alstom TGV 2N2 Euroduplex**
- **Alstom Coradia/Nordwestbahn**
- **M6 Belgium**
- **First Scotrail/Siemens Desiro Class 380**
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Argus Fluidhandling Ltd: Railsafe

Part of the Alfagomma Group, Argus Fluidhandling Ltd, based in the UK, specialises in the manufacture of hose assemblies and rigid tubes and associated components for OEM markets across the world.

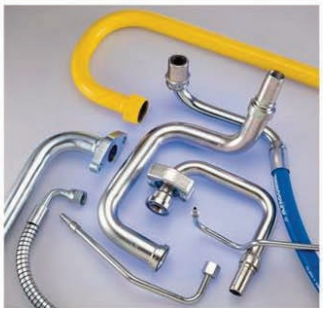
Investment in new technologies means that our customers have access to laser cutting and profiling, electric and hydraulic bending, robotic bending capability, brazing, orbital welding, robotic welding, tunnel brazing, rotary end forming and hydroforming.

A range of surface finishes are available from electro-plating to powder-coating and painting.

The Group prides itself on providing end-to-end solutions including adaptors, rigid tubes, hose assemblies and quick connect couplings.

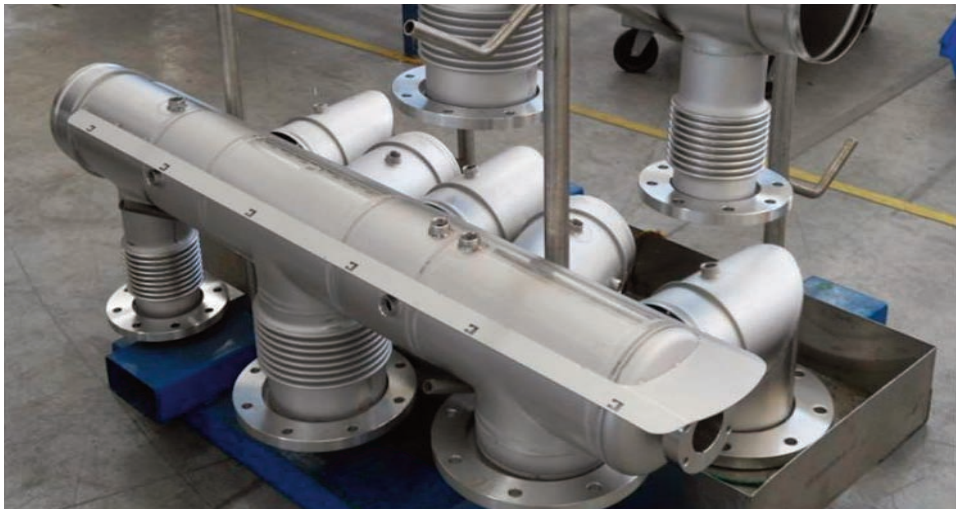
Following the acquisition in January 2016 by the Alfagomma Group, Argus now have a fully global footprint with manufacturing facilities around the world including Malaysia, Brazil and China.

Working closely with the railway industry for many years has provided us with a wealth of experience and knowledge when it comes to developing solutions for rolling stock and associated equipment and components. The introduction of a new hose meeting the requirements of NF F 16-101 – BS6853 and EN45545-2 has been a recent development. The hose has been specifically developed for the rail sector utilising the knowledge gained through our relationship with this sector over many years.



The product is available in EN853 R3 specifications with 2TE development currently underway. A range of end coupling options are available in a variety of materials including mild steel, stainless steel and brass. Specialised end fittings to customer specifications can also be developed if required.

Full engineering and technical support is available giving our customers access to the knowledge we have gained through our experience in diverse markets and applications. Products supplied under the umbrella of 9001 and 14001 accreditations provide further comfort for our current and future customers and partners.



Tamrotor
by Gardner Denver

Tamrotor – the next step

Tamrotor brings together the complete OEM competencies into one brand, to offer our customers a wide range of technologies to suit a multitude of applications.

Based in Finland, we have been designing and developing bespoke solutions to meet the demands of industry for over 50 years. So today, our customers don't only get the benefit of our state-of-the art manufacturing techniques or our extensive product portfolio.

We believe our people are one of our most important assets, helping us to bring you market-leading efficiencies and the latest innovation that modern industry demands.

Get the **most** from the core part of your compressed air system

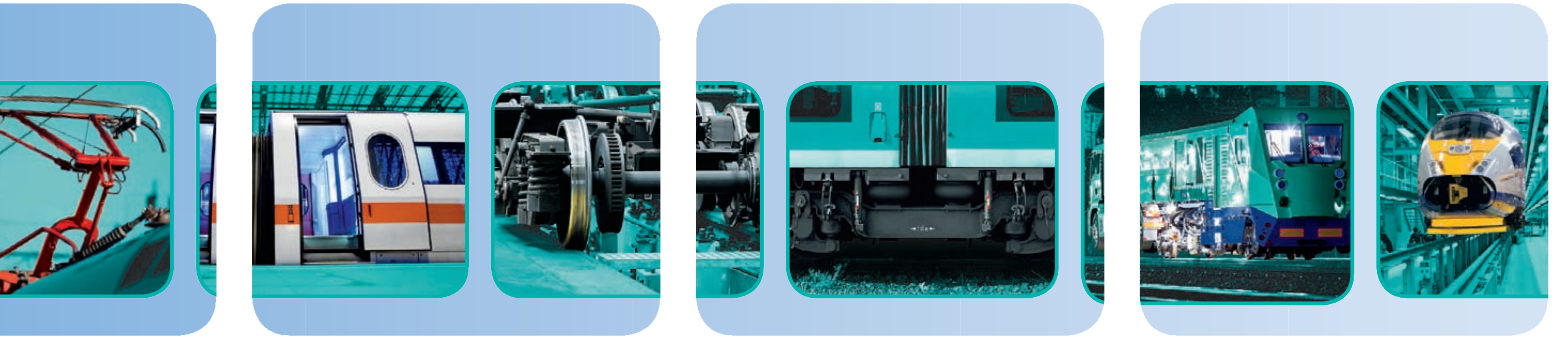
Economic travel that protects the environment.

Tamrotor compressors and air ends provide compressed air for pneumatic processes across a multitude of transport applications – used and trusted for example, by railways across the globe.

Whatever the application – you can trust Tamrotor.

Combining our design and manufacturing expertise with your specialist application knowledge means that we have developed a portfolio of products purpose built for even the most challenging industrial environments.

- Designed for for continuous 24/7/365 running
- Available even for low pressure applications at 3 bar
- Enduro air ends set standards in efficiency and reliability



Pantograph operation

Pneumatically operated doors

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Tamrotor air ends are available from 0,25 m^3/min to 74 m^3/min free air delivery.

Enduro series

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from 2.2 – 500 kW

- Premium quality air ends
- Complete range
- Designed for the harshest conditions
- Maximum efficiency
- Complete customer support

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- Completely leak-tight o-ring design
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CT series

Self-contained compressor packages;
Enduro air end + Tempest design

- Steep operation inclination angle
- Compact unit allows installation in numerous applications
- Enduro air end and Tempest design

tamrotor
by Gardner Denver

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Etu-Hankkion katu 9
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TE's new roofline power transmission

Elizabeth Da Silva, TE Connectivity's High Voltage Development Engineering Manager, explains why TE has opened its own dedicated Rail High Voltage Test Centre and how it is supporting the launch of next generation roofline power transmission that will be launched at InnoTrans in September.

Elizabeth Da Silva, TE Connectivity's High Voltage Development Engineering Manager, explains why TE has opened its own dedicated Rail High Voltage Test Centre and how it is supporting the launch of next generation roofline power transmission that will be launched at InnoTrans in September.

In July we opened a new test centre to carry out electrical and mechanical testing on high-voltage rail products for rolling stock. The Rail High Voltage Test Centre in Swindon will let us develop products more quickly and also provide a faster response to our customers' needs.

Swindon is our global headquarters for rail, where we develop products that connect the overhead catenary wires with the transformers that power traction and other on-board loads in electrified railways.

Until now, we have always used external laboratories for testing, verification, validation and qualification of high-voltage components. But we realised that by bringing these in-house, we could reduce the time to market by up to 30% and also provide a faster response to customers.

Having our own dedicated facility means that we're able to carry out more in-depth analysis, and test more alternative designs to come up with the optimum design more quickly than before.

What is a roofline system?

Roofline systems are made up of high-voltage components such as switchgear, insulators, intercar cables, surge arrestors, bushings and downleads. They also include simpler connectors like lengths of busbar or braided conductors, as well as the support structures and even nuts and bolts that hold the connections in place.

In the high-voltage world, roofline systems are alone in the extreme conditions they face. High air speeds, shock and vibration are just the starting point – the operating environment also exposes roofline systems to pollution, humidity, airborne sea salt, rapid air pressure and temperature changes, driving rain and on some lines, high altitudes. All of these factors can affect the performance of high-voltage systems.

Because every railway line has its own environmental conditions, and train operating requirements train manufacturers must create bespoke designs to avoid failure through flashover.

Also known as arc flash, flashover describes the short circuit when the current jumps through the air from the electrical conductor to the roof of the train. It leads to loss of power and has the potential to cause major disruption to timetables and services, with loss of reputation for the train operator.

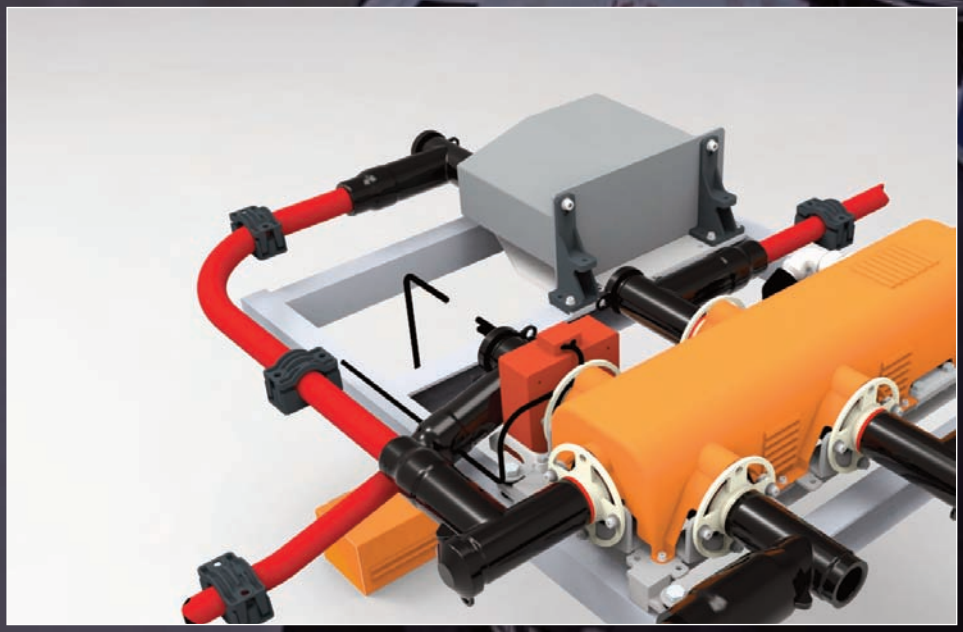
False economy of low cost components

Good design will reduce the impact of arc flash – not just in selecting high-quality components, but also the simpler connectors and supports that can be easily overlooked. Flashover happens when the electric field around a high-voltage conductor exceeds the insulating limits of air.

One technique is to increase the physical clearance and create larger air gaps, which also increases the electrical clearance. But component choice also has a big impact. Invisible to the naked eye, sharp edges and pointed components focus and concentrate electric fields, whereas smooth curved surfaces spread out the charged particles in the air.

Quality of materials is also important. Inconsistencies in the tightness of a braided copper conductor could lead to loose strands, causing highly localised concentrations in the electric field. Nuts, bolts and support steels selected on price could be vulnerable to corrosion, especially in polluted or humid air. Flakes of corroded material will then spread over the surfaces of insulators, reducing their performance.

Brass should be used as the first material to connect to copper conductors – we have found some cases where low-grade steel was used instead, which



subsequently oxidised. The result was contamination and the subsequent replacement of a high-value copper conductor, which could have been prevented at the cost of a brass nut and bolt.

Weight, clearance and aerodynamics

We have been working in partnership with train manufacturers for many years to help them create and refine roofline systems and also to diagnose faults experienced by trains in operation. Our goal is to help them improve performance, reliability and safety and so we analyse roofline systems and often recommend specifications for components that are outside the normal scope of our supply.

What we have heard loud and clear from our customers during our work is that today's train designs are driven by the total cost of ownership.

Over the life of a train, every kilogram counts and every lump and bump on a train's exterior will increase air friction. Optimal space utilisation on railway vehicles is also important, so we are always under pressure to create components for roofline systems that operate reliably within increasingly challenging space constraints.

Operational performance and reliability are also important – these ensure that services run on time while minimising maintenance.

Launching a new generation of roofline at InnoTrans

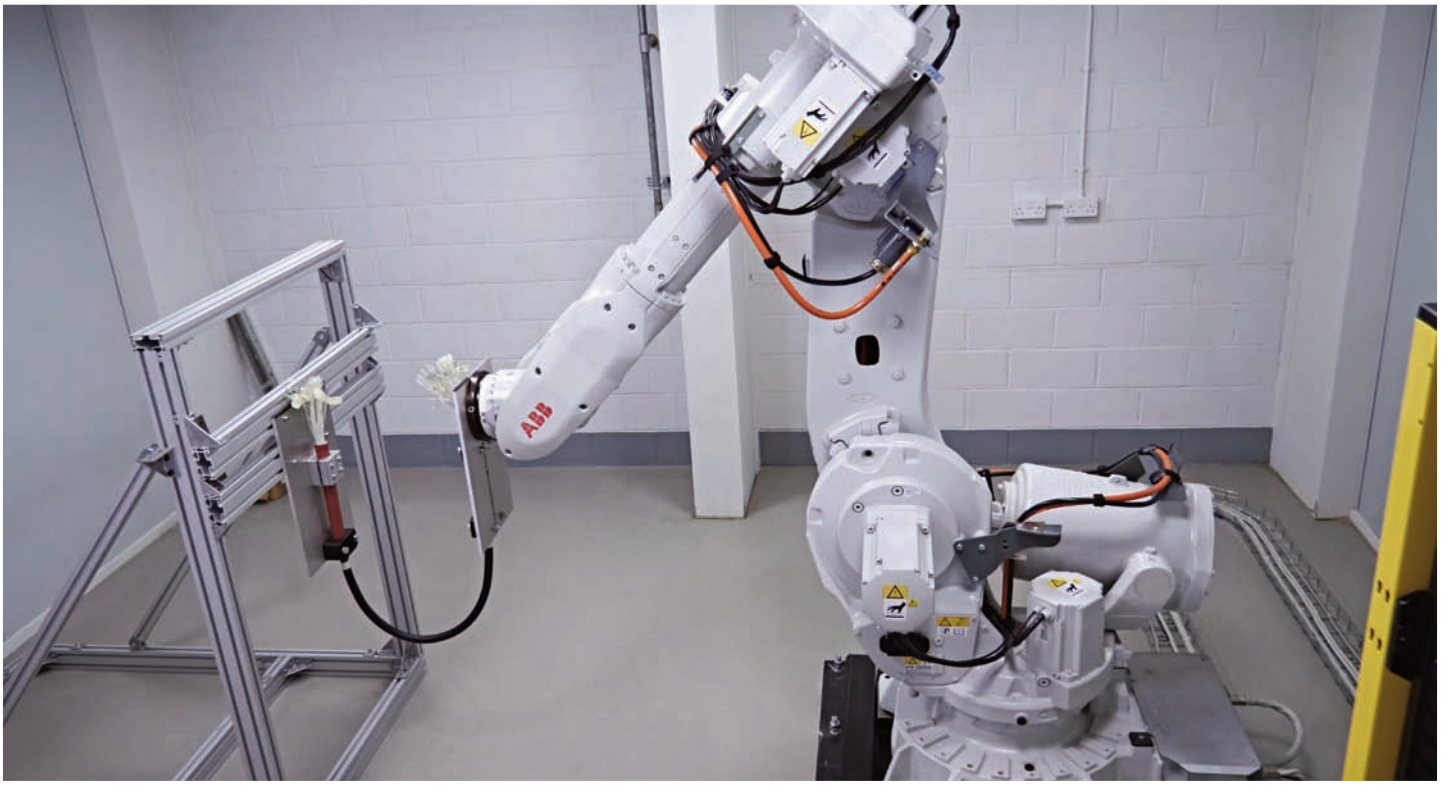
Recognising the challenges and priorities of train manufacturers and operators, we have developed a new approach to roofline systems.

We will launch our new generation of roofline systems as a world debut at InnoTrans in September. The modular subsystem is designed to achieve significant equipment space/weight savings whilst being suited to harsh environmental challenges.

The modular approach replaces the individually engineered roofline subsystem. With high-voltage components being encapsulated inside the module, they are protected from the effects of environmental conditions such as humidity, pollution or the low atmospheric pressures found at high altitudes.

Not only has the new approach enabled us to reduce the overall height and weight, but it will also remove the need to individually engineer roofline systems for every railway line – therefore letting train designers focus on other priorities.

Visitors to TE's stand in Hall 12, Booth 210 at InnoTrans will be able to see the low profile design for themselves as we'll have a prototype on display.



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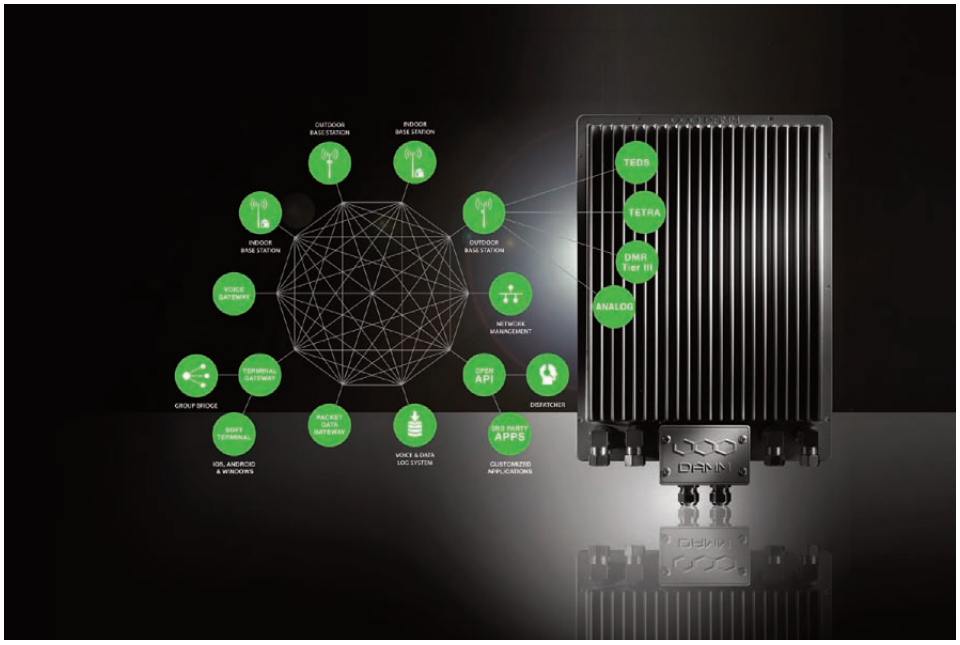
NEW DAMM Multi-Tech Platform for rail and metro

Built for the future of critical communications, the DAMM Multi-Tech Platform enables voice and data communication across technologies, including TETRA, TEDS, DMR and Analog in one fully integrated system. The new BS422 is the world's first outdoor base station featuring these 4 technologies in one box. With a simple click in the software, the BS422 can be set to run in any technology mode, or even multiple of these. One application, in one single interface covering all technologies. DAMM Multi-Tech Platform is ideal to meet the challenges in the rail and metro industry:

- **Meet the need for more data by using TEDS for train control, or pushing data to the train information system, still within the same secure and independent communication platform.**

- **Reduce number of base stations and extending track-side coverage utilising VHF in remote areas and high power output. Options include 25W TETRA and/or 50W DMR .**

- **Save installation and operation costs with a rugged, compact outdoor base station ideal for track-side installations. The BS422 is mast mountable direct at track-side due to EN 50128 approval. The BS422 offers best-in-class power consumption, lowering operational costs and**



enabling alternatives for energy supply, like solar power.

- **Easy remote management with one application for all technologies. Full remote manageable base stations across technologies, in hybrid operation, eliminating the need for on-site service, and making it ideal for remote sites.**

- **Improved Tunnel coverage, Improved node synchronisation, eliminating the need for GPS coverage by utilising IEEE 1588 for node synchronization. Alternatively use the simulcast option of the BS422; same network management platform, full output power and sensitivity.**

Stay dynamic and flexible with the DAMM Multi-Tech Platform

DAMM offers a technology independent solution covering your needs of today and tomorrow featuring Multi-Technology and Multi-Frequency, as well as Multi-Carrier and Simulcast all in one box. These BS422 highlights include:

- **Multi-Technology presenting the world's first outdoor base station featuring 4 technologies in one box; TETRA, DMR Tier III, TEDS and Analog**

- **Multi-Frequency extending coverage by supporting VHF and UHF mode in all technologies**

- **Multi-Carrier providing a flexible, cost-efficient solution by enabling up to 4 carriers in one box, and even combining multiple technologies in one box**

- **Simulcast available for DMR and Analog, and now also offering repeater functionality for TETRA and TEDS**

Industry specialists

Through the cooperation with leading rail and metro providers worldwide, DAMM understands the critical importance of communications within transport infrastructures. DAMM's TetraFlex® solution delivers high-performance digital TETRA voice and data communications providing crucial communications integration across railway operations, enhancing efficiency and safety as well as the satisfaction of personnel and passengers.

Proven global technology

TETRA (terrestrial trunked radio) was developed by ETSI, the European Telecommunications Standards Institute. TETRA technology is currently being used in thousands of mission-critical applications across more than 160 countries, and has proven its value in countless rail and metro applications as being superior to GSMR.

Optimised installation for rail and metro

The IP65 encapsulated and ruggedised outdoor base station has been optimised for use within rail and metro operations. With its compact size, it is ideal for use in the harsh environments of metro tunnels or direct outdoor mounting. DAMM demonstrate best-in-class power consumption, combined with no need for housing or air conditioning, this gives significant saving both on installation as well as operation.

100% reliability

100% uptime through full redundancy as well as by the system's intelligent distributed network architecture. All information is constantly replicated to all sites in the network, allowing call and data traffic to continue uninterrupted if one or more sites lose connection with the rest of the network.

Complete coverage and scalability

The fully IP-based technology used by DAMM TetraFlex® digital voice and data communications solutions makes it possible to create integrated communications across multiple stations, logistics facilities, depots, maintenance facilities and centralised operational control centers. It also means that the system can support any capacity, from single-site stations to large railway and metro infrastructures with thousands of users. Up to 16 carriers per node, allowing for 63 timeslots, or up to 4 control channels to secure SDS traffic and position reports.

Intuitive user coordination

User-defined groups and staff teams can easily be defined and coordinated. The highly flexible voice communication services support individual private calls, group calls, telephony communications (PSTN) and other features.

Reliable efficient data communications

DAMM TetraFlex® data services provide data for i.e. vehicle-tracking systems, timetable and journey information, signaling control or SCADA and telemetry data, supporting third party applications, such as vehicle management systems.

The advanced management of Packet Data channels enables reliable and deterministic bandwidth for data applications.

Integrated applications for increased operational performance

DAMM TetraFlex® comes complete with integrated applications. With the intuitive DAMM TetraFlex® dispatcher solution all users can easily be dispatched by the operational centers. DAMM TetraFlex® also provides a complete voice/data recording and replay facility, enabling effortless incident reconstructions and gathering valuable statistics on operational performance.

TETRA over LTE

DAMM offers TetraFlex® Android Client, iOS and TetraFlex® Windows Client - a vendor independent soft terminal, fulfilling the needs for non-critical voice & data communication operating through WiFi, UMTS(3G) and LTE(4G) networks.

Easy 3rd party application integration

DAMM TetraFlex® is supplied with an easily accessible Application Programming Interface (API) that allows straightforward development and integration of customer-designed applications.

Key DAMM features for rail and metro communications

- **IP65 protected housing for direct installation in harsh environments**
- **Compact design**
- **Easy and quick scalability without interruption of operation**
- **Reliability: redundancy, back-ups and no single point of failure**
- **Best-in-class power consumption**
- **Free choice of terminal suppliers**
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Applying science to the rail industry

At 3M, we apply science in collaborative ways to improve lives daily. 3M is a global science company that never stops inventing.

Using 46 technology platforms, our integrated team of scientists and researchers work with customers to create breakthroughs across countries and across subjects to solve challenges big and small.

Every day you are faced with the challenges that can affect the success or failure of your products. How do you reduce weight or make your products more resistant to impacts and shocks? How do you keep up with the latest trends in design aesthetics or seamlessly integrate your brand image? How do you make your products quieter or safer while cutting costs, streamlining manufacturing and boosting productivity – without affecting quality?

Keeping pace with the rapid changes taking place in rail technology, 3M has a wide range of products that can help maximise manufacturing and operational efficiencies, while lowering costs and improving long-term performance. From design to delivery, 3M innovation is helping tackle your toughest application challenges, from expanding design flexibility to improving product performance and optimising manufacturing efficiencies.

Exterior

3M solutions help protect rail car exteriors from the environmental effects of rain, sun and abrasion, keeping the car looking good, mitigating moisture ingress and more. By helping extend the life of the rail car, 3M solutions can mitigate maintenance over the long haul. Solutions include:

- **Signage attachment**
- **Door assembly**
- **Sealing and protection**
- **Window installation/glazing**

Interior

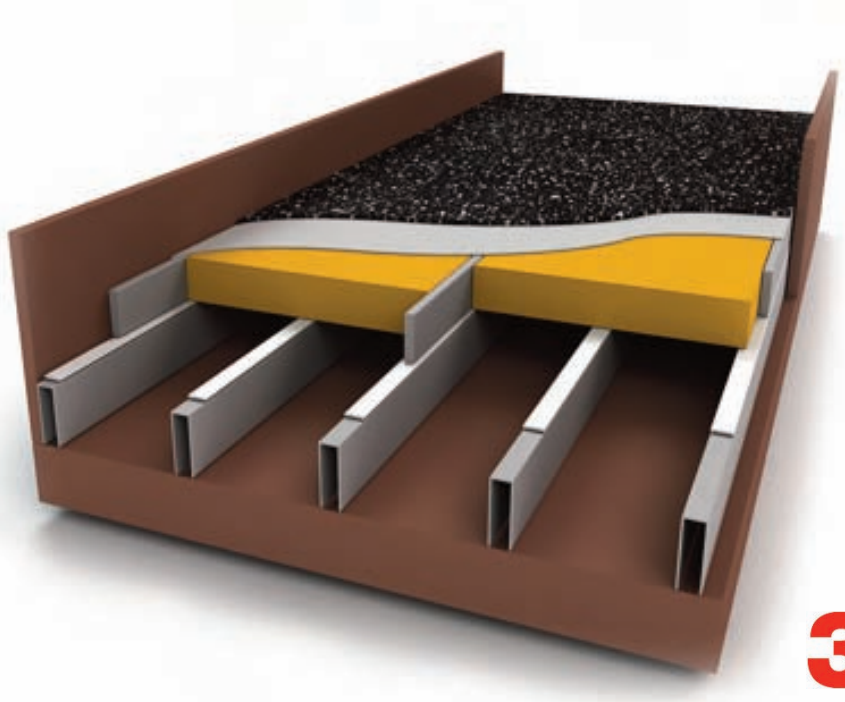
Rail coaches transport masses of people quickly, safely and comfortably. 3M technologies are there – sealing the windows, attaching interior panels and carpets, helping construct next generation composites, and keeping passengers comfortable and secure while they ride to their destination. Solutions include:

- **Removable panel attachment**
- **Window protection**
- **Insulation attachment**
- **Fire protection**
- **Sealing and noise reduction**
- **Panel bonding**

Floor System Installation

Assaulted by constant vibration, twisting and bouncing, train subfloors must roll with the punches. To maintain their long-term visibility, 3M's advance seam sealing and bonding technologies are designed to maintain their effectiveness and elasticity even after years of hard use. Solutions include:

- **Cover bonding**
- **Seam sealing**
- **Panel bonding**



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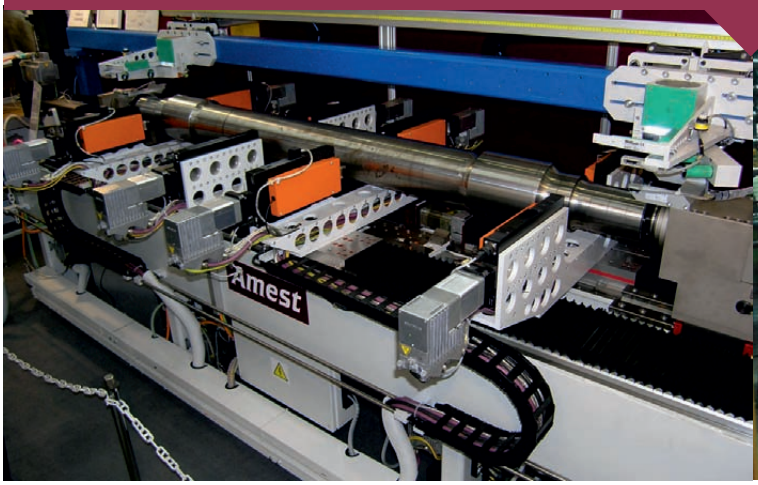
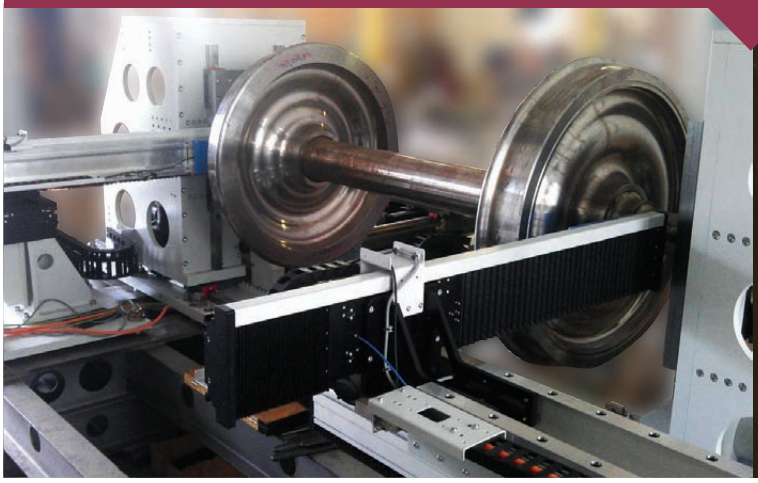


Measurement of wheelsets



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The Evolution of Rolling Stock Performance

Detectors, and Improving Their Utilization.

By Paul Bladon, Wayside Inspection Devices

How has wayside condition monitoring, as a specialised industry, evolved over the last two decades?

The wheel-rail interface is the critical system for the functionality of a railway [1]. To help optimise and maintain this interface, wayside detection systems have been used by railways for decades, from simple wheel sensors in the 1970s, to the modern-day implementations of complex sites with multiple instruments. The initiative to gain more information regarding the health-state of the wheel-rail interface has been driven by the industry's desire to increase safety by minimising derailments, as well as by minimising the total cost of maintenance [2].

Averaging Federal Railroad Administration (FRA) reported statistics for the years 2000–2010, train accidents have cost the US federal rail industry just under 300 million US dollars per annum in equipment and track damage alone, even as derailments have lowered year-on-year under increased volume [3]. A Swedish study in 2004 demonstrated that wheel/rail interface-related maintenance costs for a railway could account for up to 50% of total maintenance, and sometimes more [2].

When implementing condition monitoring, it is important to identify the right measurement technologies, as valid and repeatable measurements are necessary for an effective condition monitoring approach [4]. The business requirements must drive the selection of possible technologies.

More complex wayside condition monitoring systems began to enter the market in the 1990s, and railways began implementing temporary wayside monitoring surveys. Early permanent wayside systems began to appear in North America during the late 1990s and early 2000s.

The earliest wayside systems (other than simple wheel sensors) were hot bearing detectors (HBD), and wheel impact load detectors. These were relatively simple devices that in early implementations communicated directly to the train driver over radio if a fixed threshold was exceeded in a single pass. The technology of the more

sophisticated acoustic bearing detectors (ABD) and bogie geometry/stability detectors (TBOGI) matured during the 2000s and they became mainstream.

During this early period, railways were accepting alerts from each individual type of system, however no centralised data storage was in place. Measurements were processed in real time as go/no go alarms. In the mid-2000s, major railways and some railway suppliers began developing centralised databases. Firstly, existing stand-alone hot bearing detectors were networked to provide centralised data. Then, more comprehensive centralised databases were developed to store the incoming raw data from the variety of systems, as well as set thresholds and rules to generate alerts and alarms based on the data. Finally, composite rules based on the combined analysis of multiple data inputs began being developed, and these initiatives continue to the present day.

In the present day, the most common systems installed in supersite configurations are TBOGI, WILD, Wheel Profile, and ABD. The most common systems installed in dispersed wayside arrays are still HBDs [5].

How were early bogie performance detectors used to evaluate bogies, and what were the challenges?

Bogie performance detectors are wayside systems designed to measure the tracking performance of wheelsets and bogies, typically at line speed. These metrics include bogie geometry and bogie stability.

The earliest bogie performance detectors used simple strain gauge circuits applied to the rail itself. These systems measure a subset of the forces the rails are subjected to by wheelsets negotiating a curve.

The challenges experienced by these early detectors were:

1. Strain gauge data is variable depending on the speed, direction, loaded condition and the rail surface friction co-efficient of each pass.

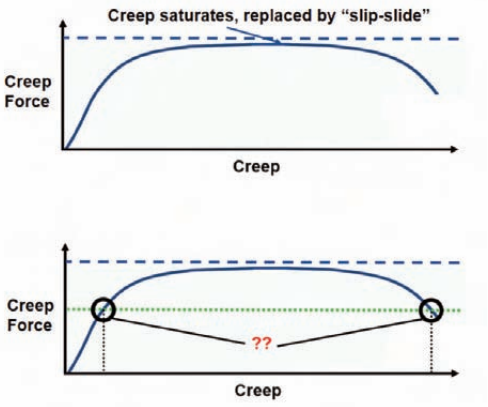
2. For a given curve orientation, a bogie exhibiting a tracking defect may actually be quite comfortable in that position due to asymmetric wheel wear having reached the point that the defective tracking is the bogie's preferred state. In this case, force measurements will not see much that's untoward, even though the bogie is heading for derailment.

3. Strain gauges measure lateral and vertical forces, but are not practical to measure longitudinal or spin forces. Strain gauges are relatively blind to a significant spectrum of forces. They therefore miss a number of important wheelset/bogie performance characteristics.

4. Strain gauges are often installed in a curve because they do not have the resolution to measure in tangent track. However, measurements on tangent track are more representative of a bogie's true steering/stability. Correctly performing bogies on tangent track have their wheels parallel to the rails and wheelsets centred between the rails; this should always be so, and a deviation is a problem.

5. Strain gauge systems do not measure hunting directly. Rather, they infer it as a factor score. This does not have direct physical meaning when a bogie is brought in for maintenance.

6. Creep forces do not grow uniformly with creep. Creep forces reach a point at which they saturate, and are replaced by "slip-slide" mechanisms. Material strain can only go so far, and beyond that point it is analogous to a motorbike spinning its back tire on the ground – the forces are too great to express in strain and are instead expressed in material loss (rubber and bitumen flying) [6]. Therefore, a low reading from a strain gauge can either be a good thing, or an extremely bad thing, but there is no way to tell just from strain gauge readings:



Strain gauges certainly have their place in wayside data collection and are useful for a number of applications, particularly for detecting wheel surface defects, however for wheelset/bogie performance detection they have experienced a number of challenges. Wheelset and bogie tracking is fundamental to the wheel-rail interface, and should not be given superficial treatment. The advantages of getting it right have been proven time and again.

How do modern BPD

evaluate the wheel-rail interface itself, and what have been the experiences in improving the utilisation of this information?

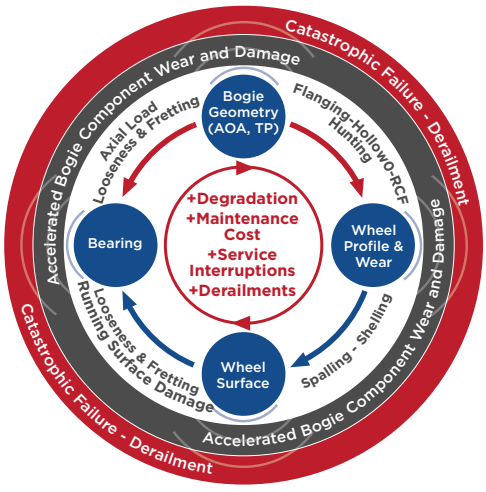
In response to the industry's need to better identify sub-performing bogies, the modern generation of bogie performance detectors was developed (TBOGI). TBOGI systems are based on optical technology, and measure the wheelset/bogie geometry and stability on tangent track where the bogies are in a free-rolling condition un-coerced by curving forces.

The modern optical-based Bogie Performance Detectors overcome the limitations of the force-based systems by directly measuring the key parameters to evaluate the wheel-rail interface, specifically the wheelset Angle of Attack and Tracking Position, as well as the lateral dynamic stability (Hunting) of each wheelset and bogie, to provide an accurate and holistic understanding. Each parameter is distinct, and directs maintenance to a set of root causes, rather than just the most obvious defect.

Wheelsets or bogies that are not performing as intended reveal when the wheel-rail interface is fundamentally compromised. Beyond any single component, a sub-optimal wheel-rail interface is primarily responsible for accelerated wear regimes on both rolling stock and rail, resulting in higher maintenance costs, higher derailment risk and higher rolling resistance.

The utilisation of the modern bogie performance data has also improved to identify wheelsets and bogies that will experience accelerated/degenerative wheel wear early in the process, to break the cycle of repeated premature wheelset replacement, as well as repeated replacements of non-causal components. Advances in the identification of derailment-level risks have also made great strides [5]. For railways using the TBOGI systems, the increased utilisation has bettered the railway's understanding of bogie geometry and bogie hunting, and how this is being applied to target specific wheel wear and specific failed bogie components and, just as importantly, address specific wear regimes on the rail infrastructure. These relationships are being further refined for different bogie types for metro, freight, versus heavy haul railways.

The model below summarises the typical directions of causality, and which wayside systems are best suited to each quadrant of the model [7]:



What are the possible future directions for wayside condition monitoring?

The railway industry has come a long way since the first 'wayside systems' of the 1970s. After looking back four decades, when we attempt to look forward four decades there is precedence for optimism.

Over the last two decades, the development and deployment of wayside bogie condition monitoring systems have facilitated significant progress for the safety and efficiency of railway operations. A variety of systems employing a range of non-contact technologies have been developed to focus on specific bogie components such as journal bearings, wheel profiles, internal wheel defects, springs, brake blocks, wheel flats, internal axle defects, etc. These systems that examine specific bogie components have greatly enhanced depot inspections made by railway personnel. Also, as the condition of the bogie component evaluated does not change with speed, most of these systems could be installed on low-speed track near depots. However, because of this design, these component-specific systems are unable to provide a holistic assessment of whether bogies are performing as intended; as this requires an optimised wheel-rail interface at all speeds.

The early bogie performance detectors attempted to provide an evaluation of a bogie by measuring the rail lateral forces and L/V in curves, at track speed. The modern optical based TBOGI systems have overcome the limitations of the force-based systems, to evaluate the operating condition of the wheel-rail interface itself.
In the early days of wayside monitoring, railways began with manual data handling and manual alerts. Many railways have since made marked progress towards

automating the alerts and handling procedures where possible. This progress towards integrated data and rules has increased the effectiveness of planned inspections and reduced 'unplanned work events' [5], reduced derailments, and optimised maintenance procedures to better target causal components – which has subsequently realised substantial gains in wheel and rail life [7].

Looking forward, there is still significant scope for improving composite rules based on the data from multiple systems. The more refined these composite rules become, the more targeted the resulting actions can be.

Looking even further into the future, it is possible that train maintenance staff will be able to perform a virtual roll-by of trains before they arrive at the maintenance depot, and prioritise works and materials in advance. Also, as work continues on refining the relationships between wheelset/bogie performance and the wheel-rail interface, wayside data may be able to be better integrated with track data, so that railways will be able to know not to run certain bogies on certain track.

Wayside Inspection Devices will be at InnoTrans 2016 in Hall 11.2, Stand 205

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Longer, heavier trains, fewer maintenance personnel, demands to increase equipment availability while minimising unscheduled downtime, constant demands for more detailed and accurate record-keeping .... rolling stock managers throughout the world are feeling the heat as never before.

In this world, traditional measurement and inspection practices using handheld mechanical tools applied in challenging yard environments no longer measure up. Increasingly wheel, brake, and performance measurements are moving out of the yard and on to the mainline where automated digital inspection services provide accurate, detailed measurements of an entire fleet of cars and/or locomotives at mainline speeds. Then the data are automatically transmitted to maintenance management systems allowing shop superintendents to track and project wear rates so they can schedule maintenance interventions intelligently as needed.

International Electronic Machines (IEM) has led the charge into the development of digital inspection techniques starting with the development of the electronic wheel gauge (EWG) in 1987. This device took the guesswork out of wheel wear measurements and is now a standard piece of equipment in freight car and locomotive shops throughout the world. The EWG provides several benefits. It eliminates measurement error by taking a measurement only when the gauge was properly positioned on the wheel. It eliminates transcription error by automatically uploading the wheel measurement data into a digital environment. And it increases the value of the time invested in the wheel measurement process with its associated wheel wear measurement system, which can identify abnormal wear rates, taking the guesswork out of scheduling maintenance work. With the development of automated equipment identification capabilities, it became possible to link wayside measurements with

car/locomotive numbers, axle numbers and wheel positions. IEM responded by developing and installing the first machine vision-based wayside wheel profile measurement systems in 2006. This technology produced measurements of rim thickness, flange thickness, flange height, back-to-back measurements, and flange angle, which were all transmitted to a central server linking the measurements to the specific car, wheel and axle number.

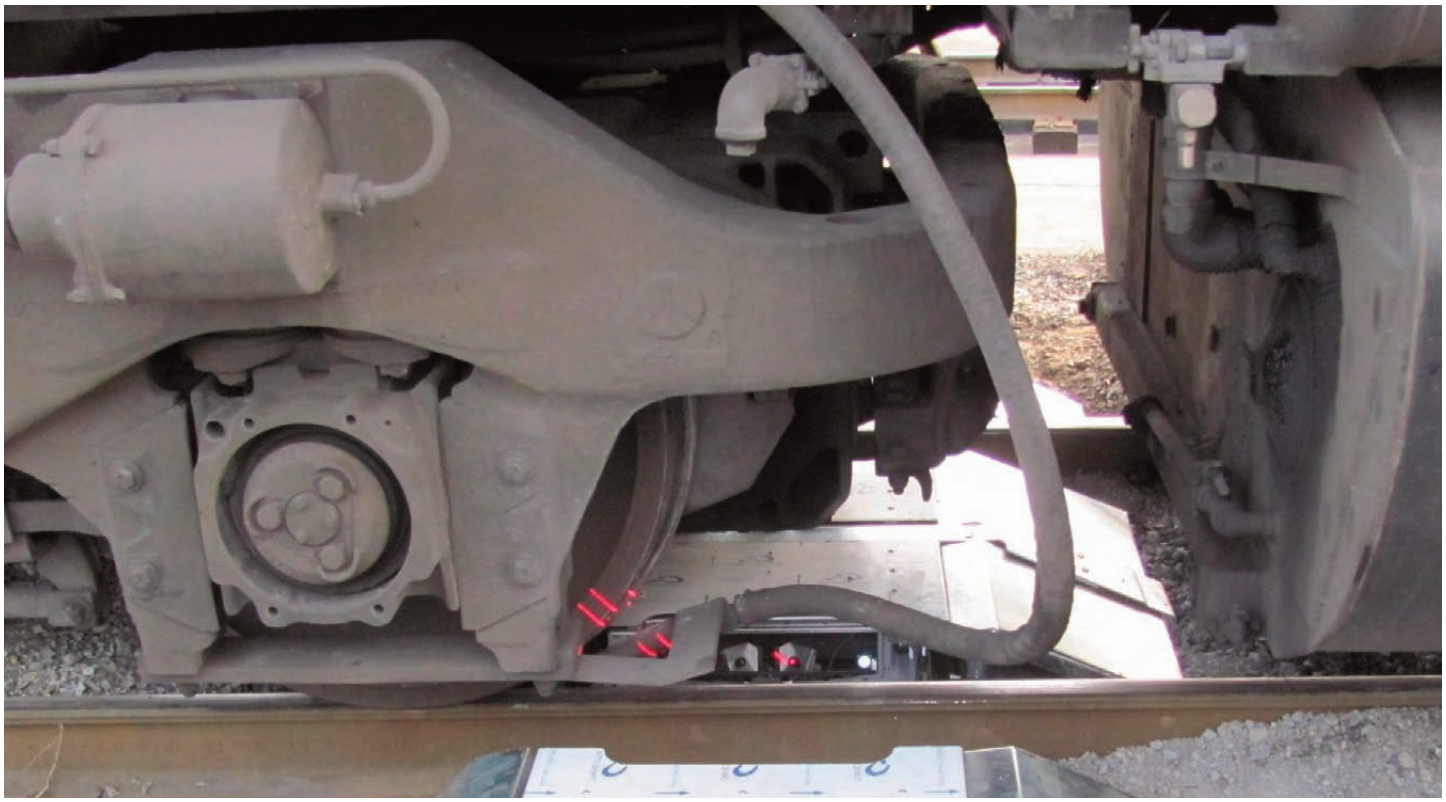
Since the original wheel profile measurement system, IEM has embarked on a path of developing and adding new measurement components including wheel diameter, brake shoe condition, disk brake conditions, sliding wheel detection, stuck brake detection, thermal and acoustic detection of faulty bearings, flat spot detection, out-of-round wheel detection, bogey dynamics (hunting), dragging equipment detection and wheel flaw detection including surface cracks and defects such as spalling and rim folloever. With ten years of experience developing, installing and refining the technology, IEM has now developed an instrumented tie box design which, by providing a single platform for multiple measurements and by "floating" with the rail, has proven to minimise maintenance and calibration issues.

These technologies are all integrated through the WISEtm (Wheel Inspection System Environment). The WISE data management capabilities transmit defect data to system managers so that wagons and locomotives with identified defects or conditions approaching a defect level can be automatically routed to a service shop where the problem can be fixed, avoiding costly unscheduled downtime in the field.

WISE installations can be located on main lines, in classification yards, and in shop environments.

By providing a comprehensive integrated family of inspection services all with common data links and operating system software, the WISE family provides efficiencies in the areas of data management, system integration, and system maintenance.

While the maximum benefit is derived from the integrated system, customers always have the option of starting small and adding components over time as needs change and funding opportunities arise.



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20 - 23 September,
Hall 17, stand 104

Visit the campaign site
and find out more about the Rectiverter technology.

www.eltek.com/rectiverter

A breakthrough in power conversion ready for rail and metro

The Rectiverter is the world's first 3-port bidirectional power conversion module, combining the functionality of a rectifier and an inverter in one unit.

A railway network is a complex environment, with numerous critical and supporting applications – all relying on reliable and stable supply of power to work continuously and keep services running. Eltek's Rectiverter system signi cantly reduces complexity and increases overview, control and reliability of AC and DC powered equipment in the rail infrastructure.

In recent years, innovations in power technology have improved reliability and driven down cost. However, in rail environments, like everywhere else, there is a need for both AC and DC power. Today, there are a number of separate AC and DC power systems, sourced from di erent vendors. This entails separate training, separate monitoring systems and separate spares.

AC and DC power combined

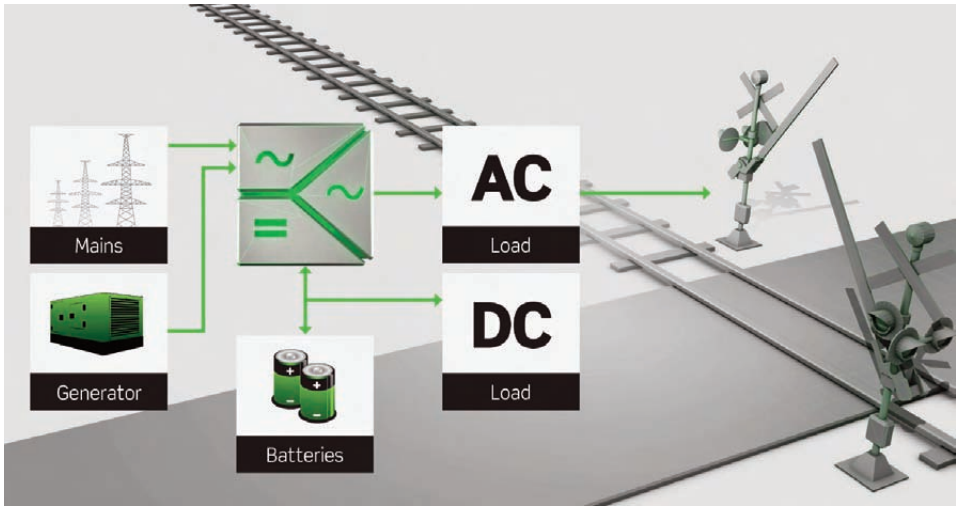
The Rectiverter changes this completely. The Rectiverter is a 3-port bidirectional converter that provides both AC and DC power simultaneously. Whereas before you needed many systems or several power stages, now you only need one. This is a fundamental change. With its ability to feed both

AC and DC applications, the Rectiverter system can replace many other systems. It reduces complexity, saves space and increases exibility immensely.

Not only is it dual output, it is also genuinely modular and can be scaled according to future needs. It reduces wasted energy due to its high overall power conversion e ciency of 96% in mains mode and 94% when operating as an inverter

Perfect for Rail & Metro

There are a number of Rail & Metro applications where the Rectiverter is a particularly attractive proposition. One example is level crossings, where, for obvious safety reasons, there are very long back-up times. Rather than using over-dimensioned AC UPS's with extra DC chargers, the DC capacity in the Rectiverter is su cient to recharge the batteries. The added reliability with the modular design, redundancy and built in transfer technology, also adds to the attractiveness.



Reduced total cost of ownership

The bottom line is reduced total cost of ownership over the product's lifetime, and a future-proof power supply infrastructure for rail & metro environments. The Rectiverter is one of the the rst new major power technology advances in rail & metro power conversion in many years.

For more information you can visit our stand at Innotrans 2016, hall 17 stand 104.

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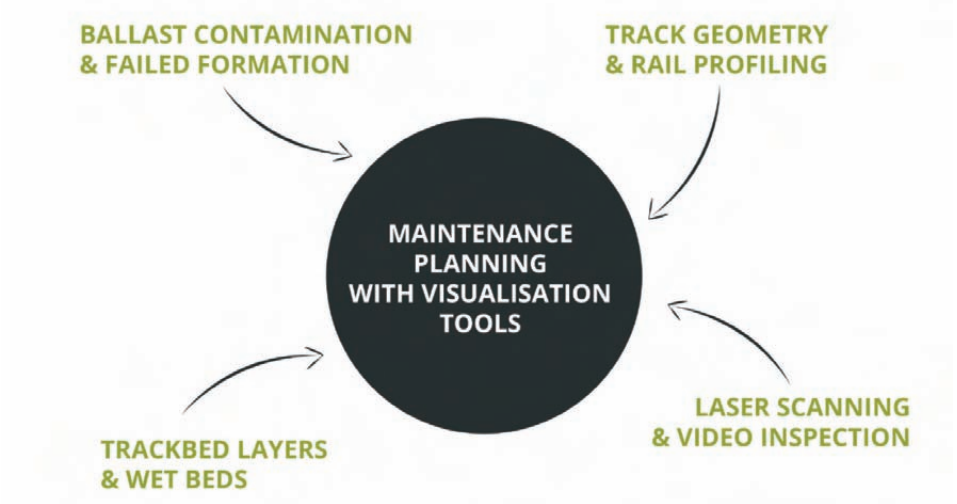
The RASC® Pod - rethinking trackbed inspection

Integration of inspection data for improved maintenance planning



The RASC® Pod is an innovative trackbed inspection solution which has the potential to improve

- **the return on investment in data capture systems**
- **track safety**
- **the cost-effectiveness of follow-on maintenance**

The system is a versatile platform which can be mounted on a wagon in-consist with a revenue-earning train (above left) or on the chassis of a hy-rail (above right).

The RASC® Pod can simultaneously collect data from a wide variety of inspection systems including track geometry, rail profiling, linescan camera surface imaging, 360o 2D laser, 3D laser, accelerometers, video, 2D and 3D ground penetrating radar (GPR), thermal imaging and catenary inspection.

The unified data stream allows integration of above and below-ground information to

- **investigate the root cause of problem track flagged by track geometry exceptions**
- **investigate the cause of derailments, and**
- **reduce the cost of maintenance**

This note covers integration of RASC® Pod data for more cost effective maintenance planning.

Data integration

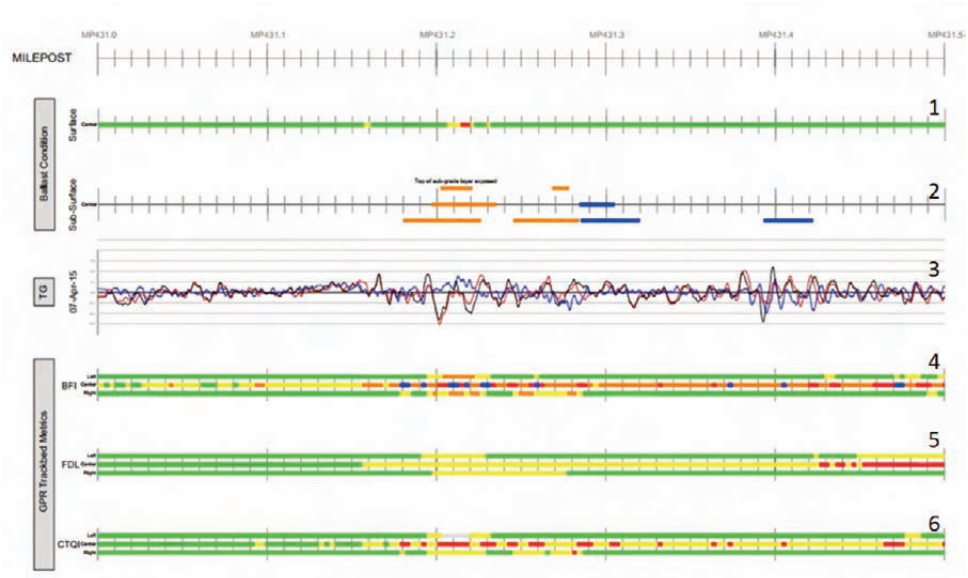
The RASC® system streamlines the acquisition and processing of the multiple data streams used to map and characterise problem track.

The benefit of this approach is three-fold:

1. Immediate recognition of the location and extent of problem track without the necessity to invest in expensive data management solutions

2. Minimising the amount of data that needs to be stored in a live data management environment reducing costs

3. Precise co-location of the individual data streams improving the accuracy of data correlation Zetica's proprietary Combined Trackbed Quality Index (CTQI) groups trackbed quality indicators, such as ballast fouling level, moisture concentration, surface and incipient mud spots and track geometry exceptions, to give a concise network-wide view of problem trackbed.



The CTQI and all of its component parameters are provide as track charts referenced to the customer's mile post or kilometre post system, geo-linked spreadsheets, standard GIS file formats and statistical summaries.

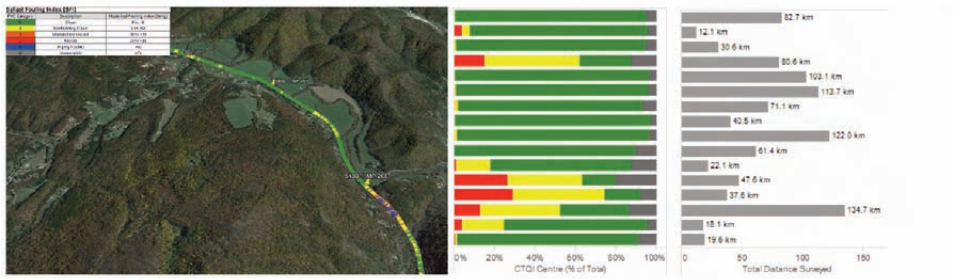
An example of data reduction from a recent RASC® survey, which collected 7Tb of raw data, was that just 20Mb of CTQI results were required for high-level characterisation of a 2,000km network.

Once problem track has been identified, an assessment of the cause and potential remediation solutions can be aided by detailed trackbed condition reports.

The above example shows an integrated track chart view for a 0.5mile section of track presenting mapped surface mud spots (1), below-ground extent of mud spots and ballast pockets (2), track geometry – left/right profile and twist (3), ballast fouling index (4), ballast fouling depth (5) and CTQI (6).

RASC® deliverables include categorisation of mud spots by extent as well as proximity to joint bars and transition structures. Example imagery from the linescan camera trackbed imaging system on which this mapping is based is shown below.

Mapped surface mud spots are linked to the subsurface fouling extent and combined in a ballast defect report as shown in the example above. Individual defect locations are ranked based on a range of parameters in order to help assess their severity in terms of track safety and to prioritise maintenance.



Integrated data views are available through the RASC® Viewer desktop software solution. This links the CTQI metric (and all of its components), laser views, and track geometry, to on-track video data and Google Map overlays, referenced by milepost or kilometre post and latitude/longitude.

The software includes search functionality, which allows the location of specific trackbed issues to be quickly located across the dataset. Outputs from the RASC® survey are accessible through the RASC® Viewer.

Maintenance work order recommendations

The data integration tools enable evidence of trackbed quality to be easily aligned with field observations. The results can then be used to objectively prioritise maintenance based on available resource and budget.

Maintenance methods typically considered include ballast screening, tamping, shoulder cleaning, track lifting and rehabilitation. Rules for determining which activity is most appropriate are based on the RASC® deliverables as well as planning considerations such as minimum economic extent of track to maintain and the distribution and frequency of track assets such as crossings and transition structures.

Quality control

Deploying the RASC® Pod on recently maintained or newly installed trackbed offers the potential for QC, benchmarking and the implementation of continuous improvement programmes.

RASC® systems can be used for a variety of QC tasks such as

- **Baseline track geometry measurement**
- **Verification of rail profile, anchor and spiking patterns and clip replacement**
- **Confirmation of the lateral and depth extents of ballast cleaning**
- **Confirmation of as-built subgrade gradient (cross-fall) on newly-built track**
- **Conformance to design standards**

Forensic assessment of trackbed condition

The RASC® data suite provides the information required to help investigate track geometry exceptions and in the forensic analysis of derailments, improving the understanding of root cause and helping reduce the risk of reoccurrence.

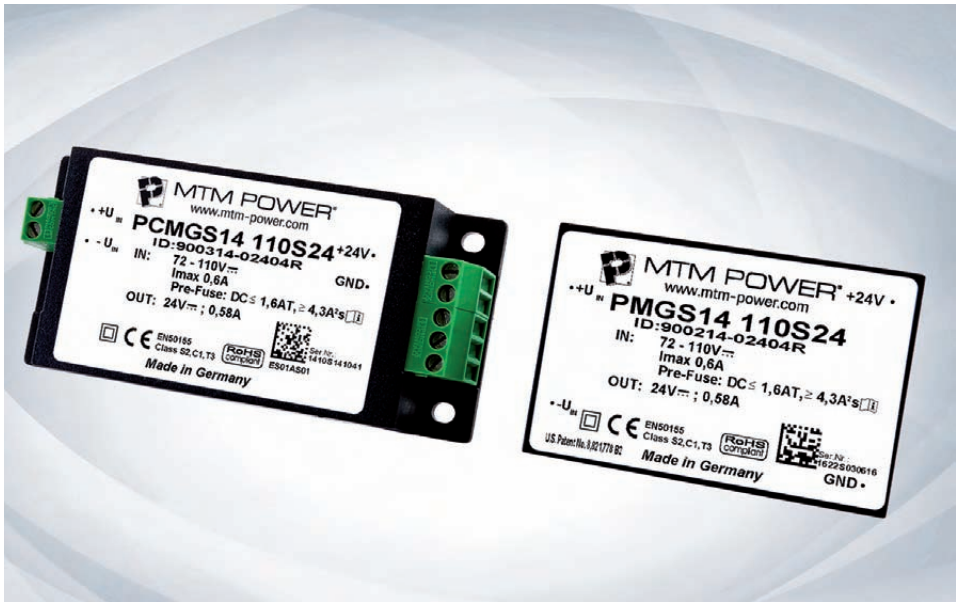
RASC® data can also provide valuable input to monitor settlement of trackbed on embankments following heavy rainfall events and can be used to map sand ingress in and around ballasted track following sand storms in desert areas.

This article is the second part of a two-part feature. Read part one in Issue One of 2016.

References:
Zetica Ltd, January 2016. The RASC® Pod – rethinking trackbed inspection. Part 1: Improved ROI for trackbed inspection and enhanced track safety. www.zeticarail.com

MTM Power® – stay on track with our innovations

In recent years, MTM Power has increasingly developed into one of the largest power supply manufacturers for railway applications in Europe.



The decisive factor is the quality of the company's innovative products and the flexibility and reliability of the base business. MTM Power products meet all relevant standards, and VDE/EN/UL regulations where applicable. To guarantee high quality and reliability, a worldwide unique thermo-selective vacuum encapsulation (European Patent EP 1 987 708, U.S. Patent No. 8,821,778 B2) and large-scale testing and examination, including burn-ins, are also included. MTM Power offers a wide range of EN 50 155-compliant DC/DC converters with 30 W – 600 W which are especially designed for vehicle and railway applications.

Particularly for the sophisticated use in trains, these devices supply the electric and electronic systems on board and trackside. Besides these rail converters, the product range includes filters and multi-power supply systems. At the same time, custom-made products or modifications of existing products can be realised in relatively small volumes, if required, and in a short period of time.

The series PMGS/PCMGS14 for railway applications is available with a nominal input voltage of 72 VDC or 110 VDC and provides an output voltage of 24 VDC (12 VDC and 48 VDC on request). The converters come with an input reverse polarity protection by a series diode and are continuous short circuit protected. The devices operate at an ambient temperature range of -25 to +70 °C (EN 50 155, class T3), have a high efficiency of ≥90 % and an

isolation voltage of 1.5 kVAC. They fulfil the safety standards acc. to EN 50 155, EN 50 124-1 and maintain the EMC requirements acc. to EN 50 123-1. The converters are designed to withstand interruptions of the supply voltage up to 10 ms and thus comply with class S2 acc. to EN 50 155.

Depending on the application, they can be used for print (PMGS) or chassis mounting (PCMGS). Optionally, they are available for DIN rail mounting. Depending on the model, the dimensions are 76.0 x 50.7 x 22.7 mm (PMGS) or 110.0 x 50.8 x 23.0 mm (PCMGS). The vacuum-encapsulated converters are maintenance-free, prepared for the use in devices with Protection Class II. They show a mechanically and electrically rugged design using SMD technology and undergo an automatic piece-by-piece test.

The DC/DC converters of the series PCMDS are especially designed for applications in vehicle and rail technology. Furthermore, they can also be used in industrial and telecommunication applications. MTM Power offers these converters with three wide input ranges thus covering the battery voltages of 24 V, 36 V, 48 V, 60 V, 72 V, 80 V, 96 V and 110 V acc. EN 50 155. They are available with 30 W, 60 W, 80 W and 150 W output power and galvanically isolated output voltages of 5 V – 48 V. The maintenance-free converters are connected via spring clamps, which meet the special requirements e.g. in railway applications as regards to vibration resistance and reduced time for wiring.

The thermo-selective vacuum encapsulation guarantees homogeneous heat dissipation within the modules as well as an excellent resistance against environmental influences such as shock, vibration and humidity. The converters need no ground load and are short-circuit protected by primary and secondary power limiting. Further features are reverse polarity protection in connection with an active input current limiting. The converters with 30 W and 150 W are also available as 19" plug-in unit.

The DC/DC power supply systems of the series MPG are designed among others for different applications in transportation, telecommunications and the charging of lead batteries during stand-by parallel operation. The universally usable, modular and easy-to-scale system is based on the DC/DC converters of the series PCMD250W and PCMD400W which are proved in transportation applications. The series is available with 2 to 3 plug-in positions (MPG2 and MPG3) for

the 250 W or 400 W converters and a total output power of 500 W to 1,200 W. With differently wide input voltage ranges between 14.4 VDC and 154 VDC, the devices supply output voltages between 12 VDC and 110 VDC. The output voltage operates with IU characteristic curve. The system can be switched into an energy-saving stand-by operation via a remote control input.

Further features are signalling of input and output voltage by an LED as well as a potential-free power good signal. The whole system is passively cooled by convection and is designed for an ambient temperature range of -40 °C to +70 °C.

The series HVC with 250 W is available with an input range of 420 VDC to 1,100 VDC and the standard output voltages of 24 VDC and 27.6 VDC. The high efficiency of 88% and the dimensions of 330 mm x 170 mm x 87 mm allow an operation without forced ventilation. Moreover, the converters work within an ambient temperature range from -40 °C to +85 °C acc. to EN 50 155.

With these high voltage converters it is possible to supply electronic equipment out of 600 V / 750 V contact wire. The DC/DC converters are used for supplying points, signal lamps and electronic monitoring of the rail net. The specific feature of the series HVC is its use as a self-starting module for trams or trolley buses with exhaustive discharged batteries so that the towing process can be avoided. The rugged design together with high-quality components guarantee the high reliability in vehicles even under severe shock and vibration conditions.

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CML: Illuminated travel

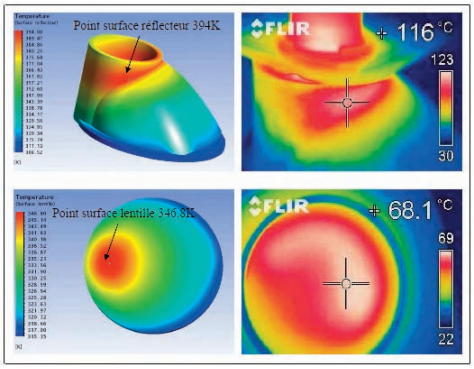
Part of the lighting business unit of Grupo Antolin, is one of the largest worldwide suppliers of miniature lighting solutions, having approximately 2,000 employees and an annual turnover in the region of €350m.

Together we are a vertically integrated designer, manufacturer and seller of one of the widest selections of miniature lighting systems and components in the world.

In addition to supplying traditional lighting technologies to customers such as Boeing and Airbus, CML has been at the forefront of the introduction of LEDs with an early developmental highlight being the incorporation of LEDs into stamped metal circuits. Continued innovation has seen light guide technology develop from the dashboard into complex ambient lighting solutions. CML light guides can now be found in almost all of the world's premium vehicles including, but not limited to, BMW, Mercedes, Ferrari, Rolls-Royce and Audi.

CML is now looking to expand its portfolio by developing additional lighting solutions for the rail sector. CML's key strengths to help bring the best technical solution to market include:

- **world class R&D and innovation capabilities**
- **advanced design software with integrated optical simulation**
- **advanced electronics design and thermal simulation capabilities**
- **in-house laboratory and test facilities**
- **in-house tooling capabilities with industrialisation (for example injection moulding and automation)**
- **global production facilities**

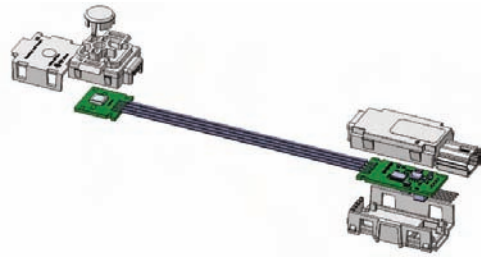


- **automotive standard project management techniques**
- **strong links between t echnical and commercial teams**

To support the move into the rail industry, CML will be exhibiting at InnoTrans 2016 and can be found in Hall 3.1 on stand 502.

The stand will include examples from CML's existing product portfolio as well as ideas, examples and solutions targeted specifically at the rail industry.

On show will be some of CML's existing range of IP68-rated LED indicators which can readily be



adapted to provide illumination for applications including steps and entrances. Features such as colour and intensity can be adjusted to meet specific customer requirements whilst features such as flashing and dimming can also be incorporated. As many visitors to InnoTrans will be aware, CML already produces a range of rail parts approved to DIN EN 50155, AAR S-5515 and S-9401 specifications.

As an example of CML's capabilities, a seat integrated reading light will also be on show. This will utilise highly reliable, touch-sensitive switch technology. Such technology offers many advantages such as flexible location options and the potential to add additional functions such as intensity variation and colour adjustment.

Visitors will also be able to see examples of CML's light guide technology which can be used to create accent and ambient lighting and can also, in conjunction with CML's colour changing light engines, be used to reinforce brand awareness.

There will also be the opportunity to see some of CML's large range of LED modules. These can be used to provide additional ambient or emergency exit lighting.

CML has the optical capabilities to support the development of high-intensity solutions for rail exteriors. A technology demonstrator has been developed (and will be displayed) for the US sealed-beam market and is capable of producing more than the specified luminous intensity of 200,000 cd.

CML has a long history of assisting customers, in very demanding markets, to develop lighting solutions, whilst benefitting from the economy of scale of established technology.

Whether your requirements are for interior applications such as seat lighting, cabin lighting, entrance lighting or exterior applications such as sealed beam lamps, CML is the company to talk to. Visit CML in Hall 3.1 on stand 502.

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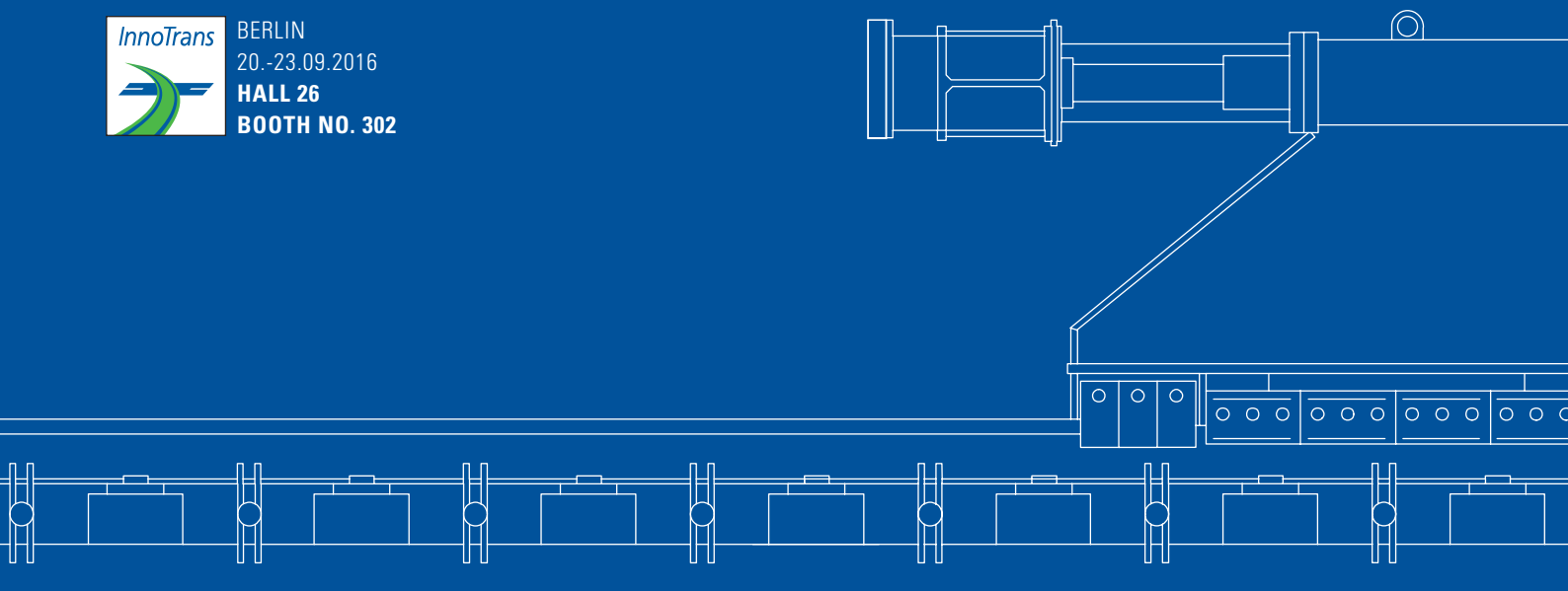

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A Look Ahead – Maglev 2016

On 23–26 September 2016 the International Maglev Board will be hosting its 23rd International Conference Maglev 2016, in the context of the InnoTrans 2016 'Conference Corner'.

By Josephine Cordero Sapién

This event will be the first to take place in this new Conference Corner – an opportunity set up by InnoTrans to meet the growing demand for lecture opportunities at the show. It will be held at the Berlin Exhibition Grounds (Messe Berlin), **Halls 14.2 and 15.2, East Entrance.** The main theme of the conference will be **'Maglev Solutions for People, Cities and Regions'**.

Maglev Technology and Speeds

'Maglev' is a portmanteau of 'magnetic levitation'. Instead of using tracks, trains are moved by electromagnetic force – electrically charged magnets lift and propel the vehicle above the guideway. It is a method that can deliver much faster speeds than regular wheeled trains, with potential speeds matching those of jet aeroplanes – up to 700km/h. On 21 April 2015 a Japanese seven-car manned maglev (L0 Series) operated by JR Central broke the world speed record for trains when it reached 603km/h on the Yamanashi Test Track in Japan. By contrast, the current world record on steel rails was set by the TGV POS, a train built by Alstom and operated by SNCF, on 3 April 2007 in France, with a maximum speed of 574.8km/h. The regular operating speed of Japan's 'bullet train, the Shinkansen, is 320km/h.

The maglev trains currently in operation around the world are:

- Shanghai Maglev Train (China)
- Linimo (Japan)
- Incheon Airport Maglev (Japan)
- Changsha Maglev (China)

The maglev for the Incheon International Airport Line is manufactured by Hyundai Rotem Company (South Korea), who will be exhibiting at InnoTrans in **Hall 3.2 / 101**

Disruption Technology

The President of the International Maglev Board e.V., Prof. Johannes Klühspies, called maglev technology a 'rupture trend' because it could supplant traditional transport practices. Indeed, as a non-contact technology, maglevs don't rely on wheels, bearings, axles or steel tracks. They would experience no rolling resistance and maglev trains currently in operation have only required minimal vehicle and guideway maintenance. However, they would require special infrastructure, unlike conventional high-speed trains, which can use conventional tracks at lower speeds for example. The maglevs currently in operation are still subject to aerodynamic drag and electromagnetic drag, but this former issue is not necessary. For example, the Swissmetro project proposes to operate maglevs in an

evacuated or partly evacuated tunnel. This could in theory massively increase potential speeds.

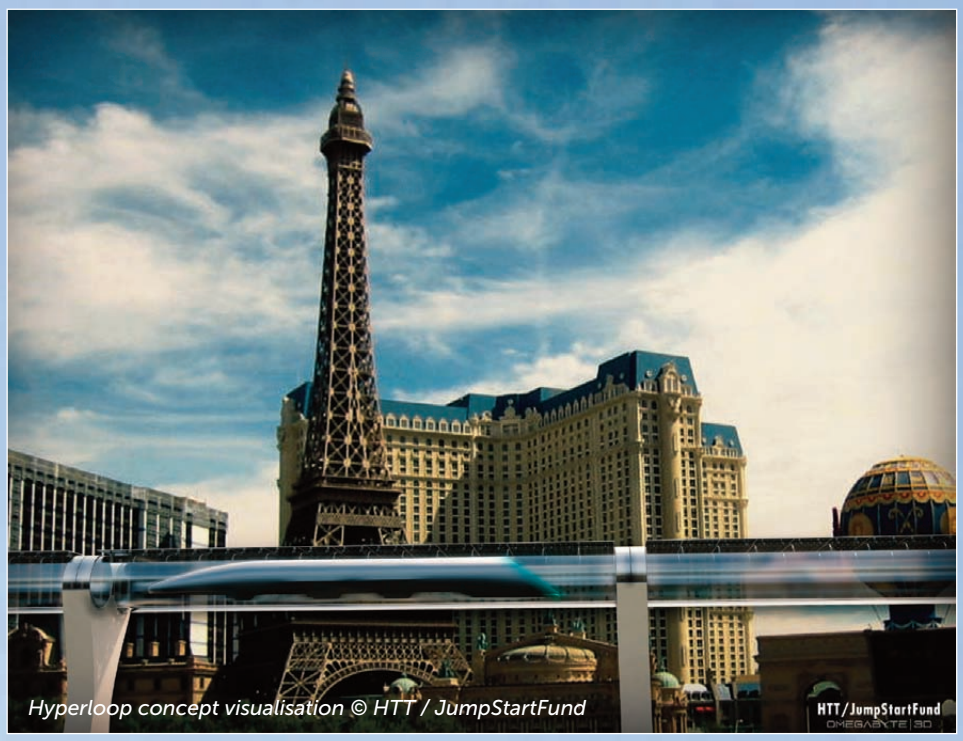
Hyperloop

This is where the futuristic Hyperloop technology comes in. This technology also aims at eliminating the problem of aerodynamic drag by operating in tubes. There are a few companies working in this field, all with their own individual approaches to reducing the cost and power demands of 'traditional' maglev systems.

If you are interested in learning more about Hyperloop systems, Hyperloop One (USA) are exhibiting at InnoTrans **Hall 3.2 / 201,** as are Hyperloop Transporation Technologies Inc. (USA, **Hall 20/21 / 100**) and TransPod Inc. (Canada, **Hall 2.2 / 401**).

Maglev 2016 Conference Programme

During the regular InnoTrans days, preceding the actual conference, there will be a guided maglev innovation tour from 4pm–5pm on 20, 21 and 22 September. On Friday, 23 September, all three Hyperloop companies mentioned above will be hosting receptions in the morning, before the opening ceremony at noon. That day's keynote speech will be given by Zaitcev Anatoly (Russia).



Hyperloop concept visualisation © HTT / JumpStartFund

The following day, Saturday, 24 September, will open will a panel discussion 'Hyperloop: science experiment or the future of travel?', with further keynote speeches on maglev systems already in operation, as well as others from experts from South Korea, China and Germany. Saturday's events will close with a gala dinner.

Sunday will see further talks and video presentations taking place with speakers from Italy, the Netherlands and Turkey joining in. The closing ceremony will be held at 12.45pm.

Monday, 26 September is reserved for a technical excursion with a 9.30am departure: 'Dresden – Supratrans'. Separate registration is required for this event. The full programme can be viewed on the maglevboard.net website.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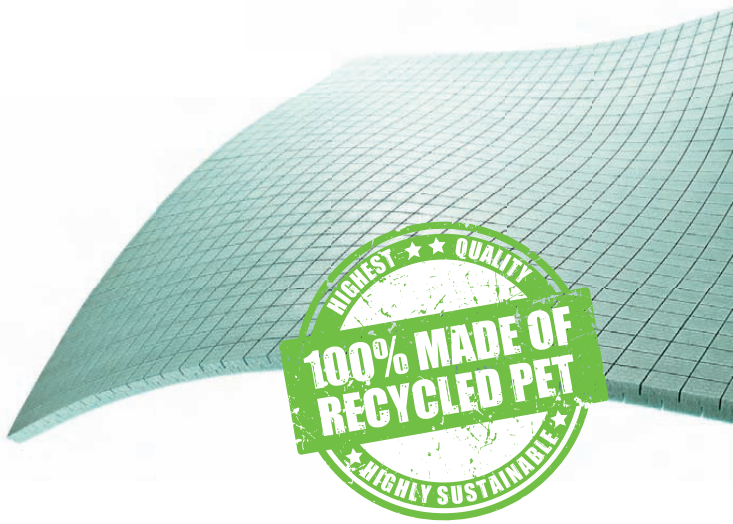

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By far the market leader, Zonegreen's DPPS™ has an unrivalled reputation as the most advanced, high-quality, reliable, proven and widely-installed product of its kind, with installations both across the UK and around the world. The company boasts unparalleled expertise and experience in depot protection systems and employs an array of highly-skilled specialist engineering staff. Zonegreen is also an experienced and trusted provider of depot interlocking solutions.

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Zonegreen: Australia shows faith in DPPS™

Sheffield-based Zonegreen has recently added to its portfolio of international installations of its flagship rail depot safety system.

Technology developed by the rail safety specialists will be protecting the 500-strong workforce at one of Australia's most advanced rail depots, due to open this year.

UK-based Zonegreen has completed the first international installation of its new next-generation SMART Depot Personnel Protection System (DPPS™) at Wulkuraka in Ipswich, Queensland.

DPPSTM is specified in most modern maintenance facility designs in the UK and its reputation is growing quickly, having been installed in some of the largest and most sophisticated depots in the world.

It is designed to protect the maintenance staff within rail depots from their hazardous working environment. Combining powered derailers, road end control panels, train detection equipment, warning signals and personal datakeys both staff and infrastructure are protected from unwanted train movements and the threat of electrification.

DPPSTM is the most advanced, reliable and tested product of its type, and additionally can be interlocked with a depot's signalling system, removing the need for shunt signals, allowing for more streamlined processes to be implemented.

The powered derailer used by DPPSTM is the only one approved by Network Rail (the authority responsible for the UK's railway network) at present. During its development, Zonegreen underwent a testing programme in its advanced research workshop that simulated five years' of continuous use, to ensure total reliability. This cutting edge, essential piece of equipment offers absolute safety to depot staff, preventing them from injury caused by moving trains.

Christian Fletcher, Zonegreen's technical director, said: "Rail depots have always been dangerous places to work. Train movement, mechanical failure, human error and electrification, can all cause life-threatening injuries to personnel who happen to be in the wrong place at the wrong time. We help depot operators protect their most valuable asset – people – by utilising technology to minimise the risk to personal safety.

"Higher passenger numbers mean larger fleets to service, resulting in increasing pressure to achieve ever faster maintenance times. This demand, coupled with the introduction of 'silent' electric trains means the risks facing depot workers have never been greater."

The commission for the DPPSTM at Wulkuraka came from main contractor, Laing O'Rourke, who are delivering the new facility on behalf of Bombardier. It will be used to maintain a new fleet of 75 six-car passenger trains, the first

of which are due to enter service in a few months.

Both Laing O'Rouke and Bombardier are familiar with DPPS™, having worked with Zonegreen in the UK, where the system controls the train builder's six-road facility at New Cross Gate, Lewisham, and is being installed at another new six-road depot in Willesden, London, currently under construction.

Depot protection is more widely recognised and used in Europe where, during the past two decades, rail infrastructure has undergone a number of changes that have made a positive impact on safety.

Next generation personnel safety
Zonegreen's new generation DPPS™ was unveiled last year, following its first complete overhaul in 15 years.

It is designed with export in mind, offering intuitive functionality, based on a four-button controller and a graphical interface that can be programmed in any language, accommodating characters and letters.

This advanced and thoroughly tested system provides essential protection to personnel working within the maintenance environment and Zonegreen has invested many hundreds of thousands of pounds in its production.

A host of additional features have been added, following six years in development and it is now simpler to implement and use and more efficient to run. Remote configuration and assistance has also been included, making overseas installations, like Wulkuraka, straightforward and cost effective.

The customer centric focus of the new DPPSTM extends to its design, which is more ergonomic than its predecessor. A tactile membrane has improved durability, whilst high-quality electronic components have reduced power consumption, delivering further cost savings.

By continuing to utilise distributed intelligent technologies, Zonegreen has ensured that the depot protection on each road can operate completely independently. This minimises disruption in the event of an incident.

Standardised software is used to run DPPSTM, which means it can still be configured to the unique layout of each facility, but depots benefit from years of extensive refinement and testing. Every installation comprises hardware and software that has been verified independently and complies with safety standards, as defined in IEC61508 and EN50128/50129, as well as current electromagnetic compatibility (EMC) railway guidelines. In addition, it is easier for Zonegreen to share new features and updates with existing and future clients.

All software is tested rigorously and repeatedly by Zonegreen's in-house experts to reduce the risk of errors and continued testing is carried out after installation. For example, if power is cut to the

derailer, a message will appear informing the user of this change in status.

First seen in New Zealand Although Wulkuraka is Zonegreen's first installation through Australian partners, Andrew Engineering, with whom the firm has worked since 2010, DPPS™ is not new to Australasia, with earlier editions installed at two depots in New Zealand for KiwiRail.

In 2010, a five-road facility with overhead line electrification in Wellington was equipped with the safety system by Ontrack, part of New Zealand Railways Corporation. Three years later, it was fitted at the $100 million, 4.4-hectare Wiri depot in Auckland, to provide a safe working environment for the maintenance engineers servicing a new fleet of electric trains.

Christian added "Wulkuraka is part of the largest single investment in Queensland's public transport system to date and the inclusion of DPPS™ really underlines its flexibility and sophisticated technical capabilities. This is the most advanced, reliable and tested product of its type and by installing it in such a high specification, state-of-the-art facility, we believe the industry will sit up and take note. We want to raise the profile of depot safety in Australia and give it the prominence it deserves."

Visitors to last year's AusRAIL exhibition may have seen Zonegreen's equipment first-hand on Andrew Engineering's stand. The firm visited Melbourne to showcase DPPS™ using a demonstration rig with derailer, klaxon, beacons and accompanying Depot Manager software that provides a complete overview of the depot, increasing operational efficiency.

Zonegreen will be present at InnoTrans 2016 with information about their innovative safety products at the UK stand.

For further information about Zonegreen's next generation DPPS™ or its wide range of rail depot safety systems, contact the firm directly on +44 (0)114 230 0822 or visit **www.zonegreen.co.uk.**

SRS Rail System International Ltd recently supports The Brittany – Pays de Loire high speed Line.

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Supporting high-speed in France

SRS Rail System International Ltd supports the Brittany – Pays de Loire high-speed line.

Recently SRS Rail System International Ltd has completed hiring to Colas Rail a new mobile elevated work platform road rail vehicle (MEWP RRV) with operator on the Brittany – Pays de Loire high-speed line, commonly known in France as the BPL. The Icon 8 MEWP RRV is the first of a product range of ICON MEWP RRVs that SRS Rail System International Ltd have developed to not only to support and increase the size of their own hire fleet but also to offer as new RRV sales. The Icon 8 is now in its 10th month of service (as of July 2016) and remains at 99.85% reliability.

Project Background

On the 21 January 2013 Colas Rail signed a sub-contract with Eiffage to build a V350 STI turnkey overhead line for trains running at 350km/hour. The contract consists of electrifying the new twin line, which extends the Atlantic high-speed line running from Le Mans and Rennes. The stretch of line covers 182 kilometres with another 32 kilometres of connecting lines around the Sablé-sur-Sarthe and Laval.

The project is split in to two key phases:

Phase One started back in October 2014 and takes in the construction of foundations, installation of masts or supports equipped with overhead line mounting gear, rolling out of earth and feeder cables and fitting out of engineering structures and power stations.

Phase Two began in late April 2015 and consisted of laying of the track, installation and adjustment of the overhead lines, testing and operational commissioning with an in-service date planned for 17 May 2017.

Utilisation

The SRS Icon 8 RRV was operational five days a week up to 12 hours per day and remained on the project for an initial 5-week period which was extended by a further 3 weeks.

Upcoming Railway Events

September, October, November 2016

11–14 September

APTA Annual Conference 2016

(American Public Transportation Association)
JW Marriott Los Angeles L.A. LIVE, Los Angeles, CA
APTA's annual meeting is the ideal platform for public transportation professionals to network, engage in workshops and explore hot topics including transformative technology, innovative funding and finance, safety and more. Attendees will include public transportation agency and business leaders, board members, representatives of governmental agencies, manufacturers, suppliers, and consultants.
More info:
http://www.apta.com/mc/annual/Pages/default.aspx

14 September

3rd Annual UK Rail Industry Forum 2016

Dentons, London
The third UK Rail Industry Forum returns to provide an insight into the major challenges facing the industry, including essential updates on policy, rail improvement schemes and the latest news on planned developments for the UK rail sector. Over 100 senior representatives from across the UK rail sector and major industry organisations will attend, with key speakers from DfT, TfL and Transport Scotland.
More info:
http://www.waterfrontconferencecompany.com/conferences/rail/events/uk-rail-industry-forum-2016

19–20 September

4th Annual South Asia Transport Infrastructure Conference 2016

Eros Hotel, New Delhi
The 4th Annual South Asia Transport Infrastructure Conference aims to present a comprehensive overview of the current status of projects within India's many ventures into the rail network, including metro, monorail and high-speed rail. The event also offers the opportunity to engage in exclusive presentations from leading practitioners and thought leaders from the industry.
More info: **http://infraoutlook.com/events/Annual-South-Asia-Transport-Infrastructure-Conference/index.html**

20–23 September

InnoTrans 2016

ExpoCenter City, Berlin, Germany
The world's largest railway technology trade fair, held every two years, returns for September 2016 and the excitement is building. The convention takes over Berlin's exhibition grounds, filling its 41 halls and outdoor display area with over 2800 exhibitors presenting their new products and innovations.
More info: **http://www.innotrans.de/en/**

20–23 September

InnoTrans Business Days 2016

Berlin, Germany
Enterprise Europe Network is hosting its 2nd InnoTrans Business Days event during the trade visitor days of InnoTrans 2016. The events include business meetings, sessions, tours and a ladies lunch, presenting opportunities for new business, technology and research partners. The Business Days events will take place in the CityCube Hall B/100 on the fairground and are free of charge to all trade visitors and exhibitors.
More info: **https://www.b2match.eu/innotrans2016**

27–28 September

Railway Condition Monitoring 2016

Birmingham, UK
Across two days, RCM 2016 will showcase some of the latest technology and innovations in condition monitoring with the opportunity to learn, discover and exchange knowledge on how these can be applied and utilised in the industry. Previously, the event has featured 30+ individual presentations, keynote speakers and an array of exhibitors from the field.
More info: **http://conferences.theiet.org/rcm/about/index.cfm**

02–07 October

International Railway Safety Council 2016

Paris, France

The IRSC Paris 2016 theme is railway safety; facing the challenges of tomorrow's society. The event will discuss the high level of safety expected from our rail systems and will provide the opportunity to share questions and solutions through debate and presentations.

More info: **http://www.irsc2016.org/**

11–13 October

Railway PRO Investment Summit 2016

Bucharest, Romania

The Railway PRO Investment Summit is the most innovative event of the Railway Pro Communication Platform and attracts key players from the international railway market, each contributing their insights into developing rail related projects. Exhibitors present their latest products and developments. The opportunity to network with exhibitors is exemplary through direct interaction – advantageous to the growth of the railway market.

More info: **http://summit.railwaypro.com**/

18–19 October

African Rail Evolution 2016

Durban, South Africa

Take your place amidst Africa's rail leaders at the African Rail Evolution conference with speakers from big name industry players such as ABB, Transnet and Swaziland Railways. The forum aims to highlight the benefits of rail upgrades and maintenance projects and will look at future capabilities of railways in Africa including finance, cross-border trade and new technologies.

More info: **http://rail-evolution.com**/

25–26 October

Smart Transit 2016

Elizabeth, New Jersey, USA

The 6th Annual Smart Transit Congress 2016 is geared towards the latest technological solutions in transit technology. With over 400 attendees and 40+ expert speakers, you can improve your transit services for the benefit of your passengers.

More info: **http://www.smarttransitusa.com**/

01–03 November 2016

Smart Metro 2016

Copenhagen, Denmark

Smart Metro provides the ideal platform to network with global metro operators, suppliers and industry colleagues. Engage in the opportunity to share information and innovations in signalling and safety and discuss the key issues affecting metros today.

More info: **http://www.smartmetro.eu**/

08–10 November 2016

Business on Rails 2016

Sao Paulo, SP, Brazil

NT Expo's 19th Business on Rails exhibition connects suppliers and buyers from freight and passenger operators over three days, geared towards the future of rail in South America. As the only event for equipment, infrastructure, services and railway maintenance in Latin America, get personal and connect with the different communities within the industry.

More info: **http://ntexpo.com.br/en**/

14–15 November 2016

Rail Revenue World Congress 2016

Amsterdam, The Netherlands

Rail Revenue World Congress 2016 and the co-located events offer rail operators a complete education on how to improve commercial activities to become more customer-centric in their operations. The event focuses on improving revenue management, customer engagement, ticketing technologies, distribution, door-to-door experience and digital transformation.

More info: **http://www.terrapinn.com/conference/rail-revenue/index.stm**

23 November 2016

Real-Time Passenger Information 2016

Bishopsgate, London, UK

Real-Time Passenger Information 2016 will bring together local authorities, passenger transport executives, transport operators, RTPI consultants and systems suppliers to discuss and debate the current revolution in information, best practice in real-time passenger information implementation, best practice in achieving optimum ROI in real-time passenger information and cutting-edge examples of 3rd generation RTPI and ticketing systems. The landmark Real-Time Passenger Information Conference launched just four years ago, in 2012. This year will be the fifth annual event.

More info: **http://www.rtpiconference.com**/

23 November 2016

Smart Ticketing and Payments 2016

Bishopsgate, London, UK

The second annual Smart Ticketing & Payments Conference, taking place at 155 Bishopsgate, London on 23 November, and once again co-located with the transport sector's leading Passenger Information Conference, will place passengers' needs squarely at the forefront of discussion. As a sector, we need to make sure that we deliver ticketing solutions that are accessible to each and every passenger demographic, that serve the individual passenger's 'ways' and enable fully interoperable end-to-end ticketing. This conference will bring together ticketing leaders from all over Europe to present their visions, focus on the needs of the passenger and share best practice in delivering world-class ticketing systems that are designed firmly around customer requirements.

More info: **http://www.smartticketingconference.com**/

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For more information and quotations contact Thomas Thorin

Phone +46 (0)703- 30 30 35 thomas.thorin@thorin.se

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Office Tel: +44 (0) 1392 580002 | **Mob:** +44 (0) 7432 725001 | **email:** al@railway-news.com

A2B Global Media | Third Floor | 11-15 Dix's Field | Exeter | EX1 1QA | United Kingdom

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