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MAGAZINE

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ISSUE FIVE 2016 - THE INNOTRANS REVIEW

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Letter from the Editor

Welcome to the fifth Railway-News magazine issue of 2016, our InnoTrans Review.

First of all, I want to congratulate all of you who went on a really great show and I hope you managed to network and engage with colleagues and clients in a fruitful and enjoyable manner.

For me personally it was my first InnoTrans and I was very excited to attend, not least because Germany is the country of my birth. I was warned that it was absolutely massive – 'no really, you don't understand, it's huge!' – and also thankfully heeded the advice for sensible footwear. On the Monday before the official opening of the show I participated in the press events, a whistle-stop tour to give us all an overview, if such a thing was at all possible.

Over the following days then I had the pleasure of meeting people who previously had only been contacts in my inbox, of hearing inspiring people talk – my personal highlight here was the speech given by EU Commissioner for Transport Violeta Bulc at the Opening Ceremony – and of meeting and interviewing professionals from all areas of the rail industry, which meant that I got to learn about a whole host of inspiring innovations and successful solutions.

In this issue we have a number of great interviews for you to enjoy, from a wide variety of rail industry experts and innovative start-ups. We also have a feature about the Inspiro metro vehicles Siemens is delivering for the Riyadh metro to accompany our interview with Jaime Freyre, CEO of FCC in Saudi Arabia and Project Director for the FAST Consortium on the Riyadh metro.

All of us here at Railway-News hope you enjoy this InnoTrans Review. We will be back with our next magazine in the new year. As such, it might be a little too soon to wish you happy holidays. However, since it's after Halloween and the shops are already stocking up for the festive season, it is not too untimely. I at least hope the trains will be filled with travellers looking forward to visiting loved ones with many a joyous embrace at the world's stations.

I now have my first full year as editor-in-chief of the Railway-News magazine under my belt. It's been a massive privilege and also a huge, but enjoyable challenge. I look forward to what 2017 will hold. In the meantime, please follow us on Twitter (**@Railway_News**) and subscribe to our newsletter on our website: **www.railway-news.com**.
Enjoy the read!

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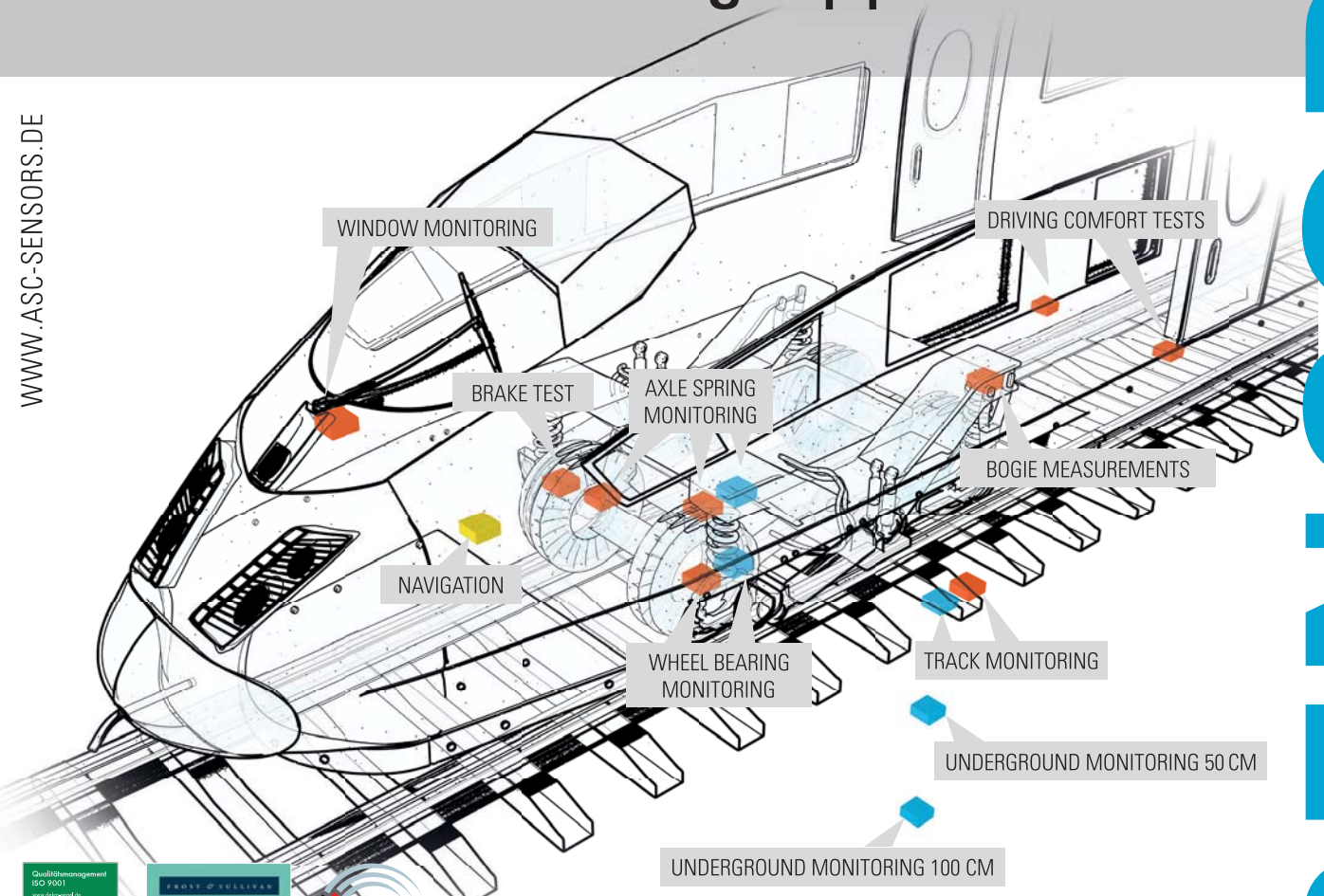

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- Ground-borne Vibration Monitoring
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CAPACITIVE ACCELEROMETERS

OFFSHORE ACCELEROMETERS

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Contents

INTERVIEWS

p.6 KehraTec
We speak with KehraTec's Managing Director Carsten Kehr.

p.16 Powernet
Vice President Harry Lilja talks to us about power supply systems and converters.

p.25 Baultar
Baultar make flooring and seating solutions for the rail industry. CEO Simon Archambault reveals more.

p.40 The Riyadh Metro: Getting the People of Riyadh Moving
To find out more about this exciting project, Railway-News spoke to one of the project's leading figures, Jaime Freyre, CEO of FCC in Saudi Arabia and Project Director for the FAST Consortium on the Riyadh Metro.

p.48 BestMile
BestMile's Executive Assistant Maud Simon explains the BestMile platform and talks autonomous mobility and integrated transport.

FEATURES

p. 39 The Inspiro Metro Train by Siemens: Ready for Riyadh
At InnoTrans 2016, Siemens displayed its Riyadh metro. It will deliver 74 of these metro vehicles that have been specifically designed to cope with the region's climatic conditions.

SUPPLIER NEWS

p.10 Amest
Automatic Measuring Station KS-619 for Wheelset Dimensions Checking

p.20 Goldschmidt Thermit
The Digital Worksite: Modern, Intelligent, Connected

p.28 Mechan
Sheffield-based Mechan Enjoys Busiest InnoTrans Ever

p.33 Parker Hannifin
Parker Hannifin Demonstrate Total Solutions Approach at InnoTrans 2016

p.36 Prose
Independent Engineering Services from A to Z

p.44 Schenk
Optimised and Systematised Vehicle Measurement

p.56 SKF
Setting the Wheels in Motion for Reducing Overhauls

p.54 UPCOMING EVENTS

KehraTec interview

We caught up with KehraTec's founder Carsten Kehr at InnoTrans to find out a bit more about the company and his aspirations for it.

By Josephine Cordero Sapién

When we met you at InnoTrans, we loved your stand, but we also thought you had a great playlist! So as an opener, I'm going to have to ask, what's playing on your stereo right now?

We've been playing Seeed amongst other things. ;-)

You have a quote on your website often attributed to Henry Ford that essentially says 'nothing ventured, nothing gained'. Is that the mind-set with which you set up KehraTec? What gave you the idea?

Over many years I have experienced that integrated hardware and software systems suppliers around the world are playing a seminal role through their symbiosis between highly intelligent camera systems and robotics. That's why I ultimately decided to go down this route.

My favourite Henry Ford quote is 'If I had asked people what they wanted, they would have said 'faster horses''. Do you sometimes go to (potential) clients and don't just provide them with a solution they ask you for, but you're able to give them a whole new perspective?

That's exactly our intention. We take on our clients' applications and then offer them an individual

solution that is based on the current state of the technology.

What is crucial here is that we're at home in many different areas of industry. As a result, we don't just offer the 'usual' industry solutions. Instead, we're able to shift a client's focus thanks to our extensive expert knowledge, if need be.

You are obviously involved in many different industries with your automation technology. However, what products do you produce for the rail industry?

We can help with the automatic laying of sleepers and 3D laser systems. We can use robots to separate out unsorted objects, we supply timber laying systems. We also have fully automatic tension clamp production lines and so on.

Your company's based in the Sauerland region of Germany. Do you benefit from the 'Made in Germany' image and how international is your client-base? What markets would you still like to tap into?

Yes, Made in Germany is a factor. Generally speaking, however, the crucial criterion is

combining all the high-tech technologies under one roof. We want to be active around the world.

What are the short and medium-term goals for KehraTec?

We want to be firm entity on the global market within the rail industry.

What are the biggest challenges KehraTec has to master?

Always being allowed to master clients' new requirements relating to their projects. 99% of the time we build solutions that have never been done before.

What achievements are you most proud of?

Having a team with which we can meet these highest standards of automation and with which we have met these standards successfully in the past.

Quite generally, what developments do you see occurring in the rail sector that you think will be particularly relevant for the future?

The arrival of industry 4.0!

You've been to InnoTrans twice now. What have been the best experiences you've made at the show?

Both times we participated, it was very intense. It's not possible for me to differentiate the two. What I can say in summary is that thanks to our many years of work developing our business and accruing the associated industry expertise, along with our technical abilities, we have achieved a high level of acceptance among our clients.

InnoTrans2018 – will you be there?

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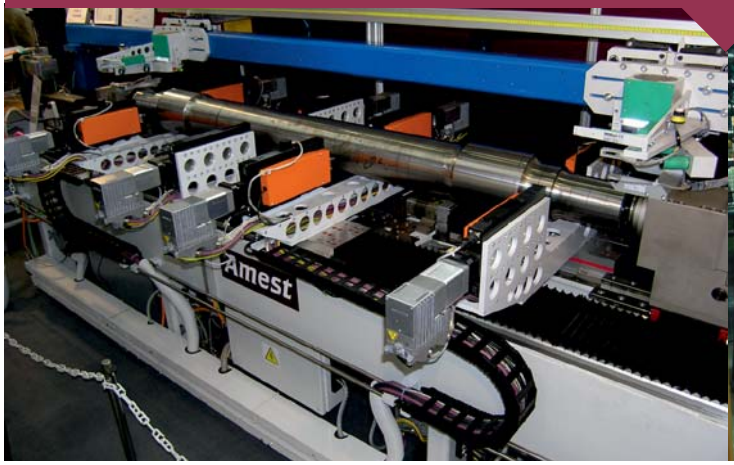
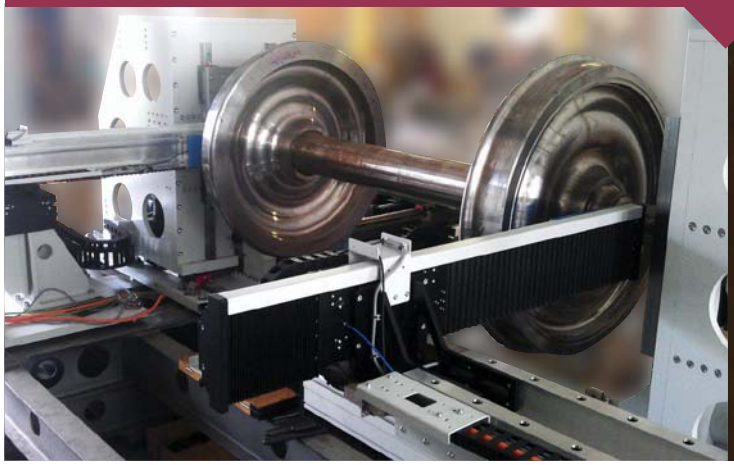


Measurement of wheelsets



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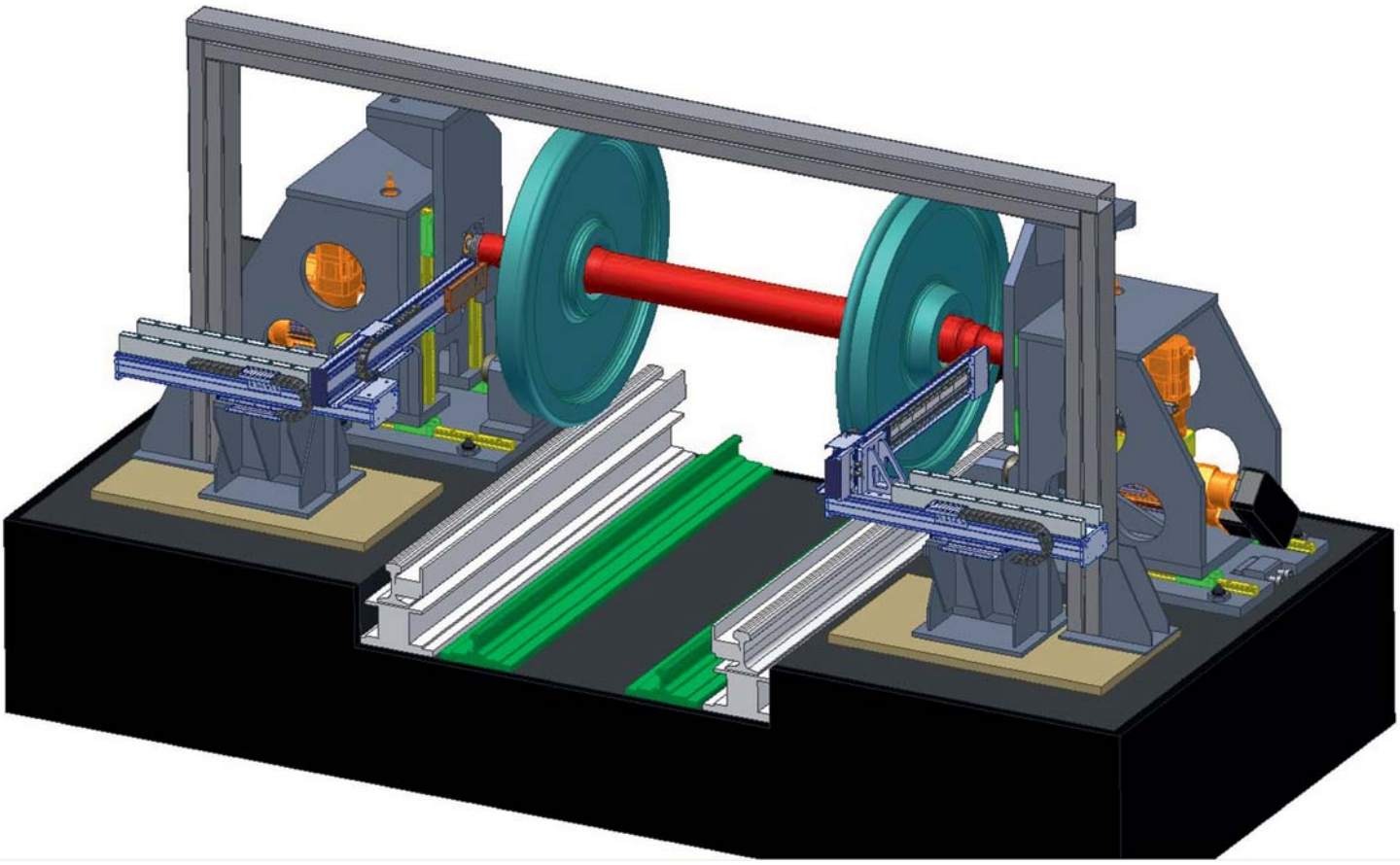
Automatic Measuring Station KS-619 for Wheelset Dimensions Checking

Amest

Company AMEST has developed a new solution for automatic control of wheelset dimensions by placing the radial-axial measuring units on cross-linear supports.



The measuring station for wheelset control is placed directly behind the pressing machine, when, after wheel pressing has taken place, the wheelset is moved into the basic position of the measuring station.

Device dimensions

Width:	2600 mm
Length:	5000 mm
Height:	2400 mm

Device weight

Total weight of the device is approx. 250 kg.

Measured parameters

- Wheel diameters
- Radial and axial run-out of the wheels
- Track gauge value
- Dimension A, B

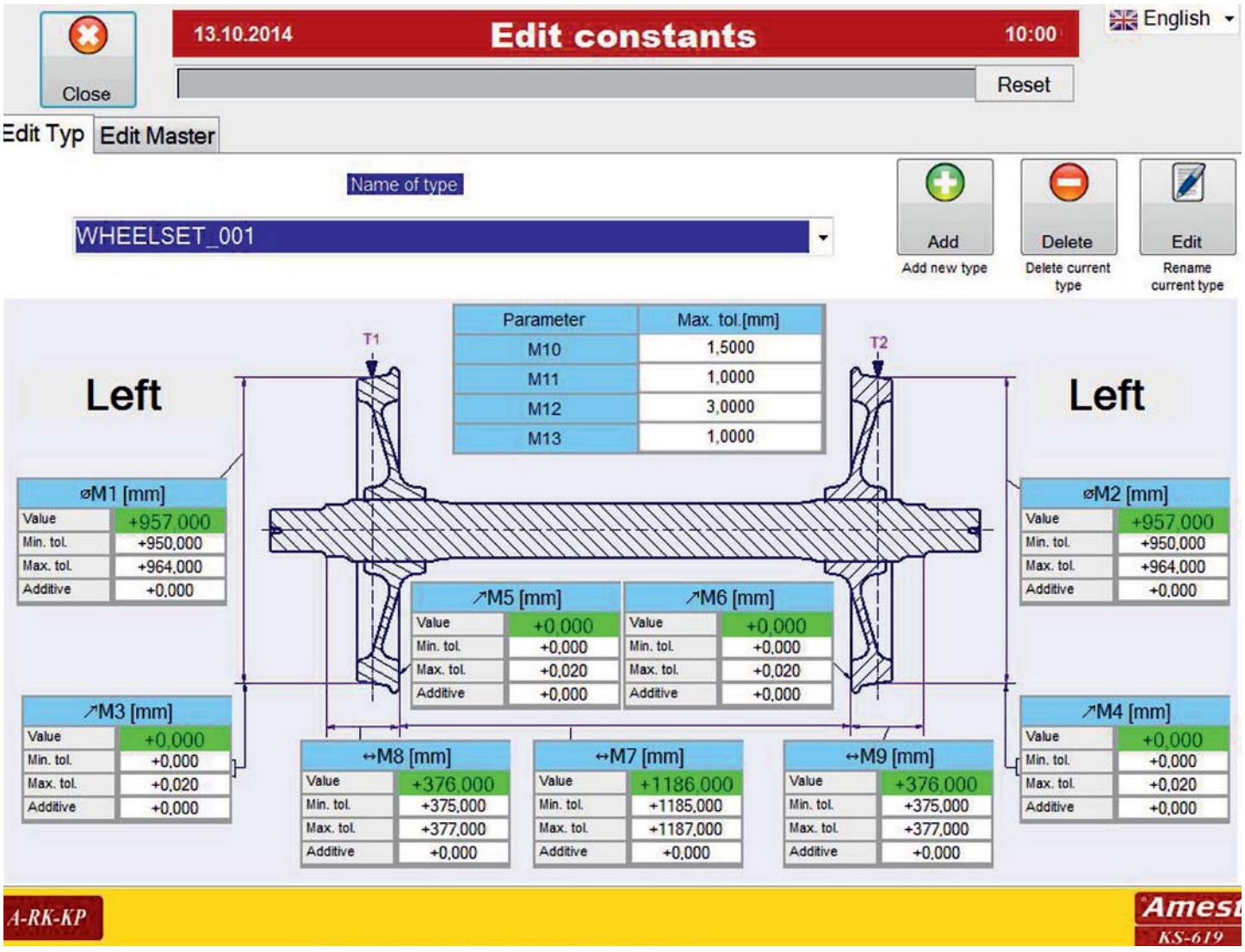
Accuracy of measurement

Accuracy of the measurement (repeatability): ± 0.001 mm

Description of device measuring cycle:

Clamping tailstocks will clamp wheelsets into pins and lift wheelsets to the same height every time, regardless of the wheelset type. While being lifted, the wheelset starts to rotate. Radial-axial measuring units on cross-linear supports measure all parameters during the wheelset rotation.

After this measurement, radial-axial units move back into their basic positions and the clamping tailstocks put the measured wheelsets into rails, where external manipulators take them for subsequent sorting into good pieces or scrap.



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The Vice President of Powernet chats to Railway-News

We live in a world where energy is everything. It quite literally powers us. Our demand for energy has been going up and is projected to increase globally in the future in both OECD and non-OECD countries, according to the US Energy Information Administration.

By Josephine Cordero Sapién

With energy being such a core element of how we live and work, it is vital that we invest in reliable, efficient, smart power solutions. We therefore spoke with Harry Lilja from Powernet at InnoTrans to learn more about Powernet and its power supply systems and converters for the rail market.

Mr Lilja, we hope you're having a successful show. Thank you for chatting with us today so we can learn a bit more about what you do. What's the history of Powernet as a company?

A: Basically, we are a small company established in 1992 in Finland so we are soon 25 years of age and we do nothing else than power supplies. Basically for different industrial customers and the rail business. Actually we had some first shots already, really in the early days, some small units were I think sold to a company who delivered some system to London underground. 20 years ago.

So you don't work exclusively in the rail industry?

A: No, the rail industry is only about 20% of our business. But it's where we have been able to grow very fast in the last five to six years.

Why is that? Have you put more effort into making your rail industry sector grow or is that a change that happened organically?

Over our 25-year history we have always been a low-volume high-mix type of company with basically 100s of customers. And of course being a small company, usually you are forced to or naturally guided into this kind of environment with low volumes and high mix because if volumes get really big then you are always facing the big competitors in the market and somebody will have a bigger advantage of the volumes like in Asia or something like that. That's the kind of environment we have always been working in. No single customer is bigger than about 10% of our business.

You have your standard power supply units, but you also produce modified units for clients, correct?

A: The size of the company we are, we are about ten million euros in revenues. We can't really compete in the market with the big guys, they will always have a cost advantage because of volumes and supply chains and other things so it means that we go for more or less niche products which need some kind of modification or customer specification for different reasons so customers might want to have their own brand for example – that's the easiest, you just put your label on and they want to control their own after market.

The units on display at your stand – are these all unmodified? Is this your starting point or have these ones already been modified?

A: We always have a lead customer with us. It starts as a special version for this customer for a project they're working on, and then of course as a bonus from that we have a kind of platform after the purchase is finished and we can use that unit then for the next customer or the next project, hopefully without too much modification.

Do you also go to potential customers and say to them you've identified a power supply need that they have? Is that how you keep the innovation as yours?

Yes, basically yes and this is quite common model in the power supply market. So the supplier's reward is that he keeps the new standard of platform he has been developing.

Other than customers wanting their own branding on your products, what other modifications might they ask for?

The biggest modification of course is developing a complete unit.

Can you tell me a bit about the ADC9000 module here? What would that power?

This is what is called auxiliary power, so it's the power that is not driving the train, it's lights, air-conditioning, doors, brakes, the different equipment in the train that uses electricity. Our story in rail actually we started in 2006–7 when Stadler sold the Flirt trains to Helsinki – the new trains for regional traffic in Helsinki – and we were asked to make a battery charger for that train. Stadler was happy and then we got more enquiries.

Where are you market-wise at the moment?

Stadler has sold trains to Russia and that has of course been the one advantage for us because our neighbour is Russia so we have long history making business with the Russians and also we know something about the certifications that they require in Russia.

Them having different ones, being outside the EU?

Yes they have their own authorities and certifications and rules. One special thing is, it's a cold environment so when you go to Siberia or somewhere you need to have units that work at minus 50 degrees Celsius which doesn't make any sense for example in the UK or in France but it is a special requirement for them.

Are these units in the belly of the train or are they exposed?

They're in cabinets inside the train.

Could they be used outside?

Yes, we're actually working on a product that will be for the train's rooftop.

Is that for Russian trains?

No, they're going to be in the German market.

It gets cold there as well. Maybe not quite minus 50.

No but of course when you go to the rooftops you get rain coming down, plus of course sunshine, which can make it extremely hot on the surface. On a hot day when the train stands still at the station, the sun is shining right on it cooling becomes an issue then.

Now that you're almost 25 years old, what are your goals from hereon in?

We want to have more customers and of course we want to have more projects also with the old customers. Small projects are often challenging because you need to invest in certification and usually you don't make much money on the first project, which is typical in this industry. But then for the rail industry it is also typical that the customer will need to have extensions on the contract. They get ten more units ordered on the same train and at that point you start to earn money back.

What product from your range is your main innovation?

This 3kw unit. The main advantage is its light and small size and that goes hand-in-hand with the requirement that you have less and less space in the train. Weight of course is an issue because the train will probably brake and accelerate for 40 years and each kg you have extra will need energy to be moved. So 1kg you accelerate for 40 years – that's how many thousand times? So how much energy will that take? So this compactness and lightness is really important.

And then we have our crown jewel here: this battery management system is the next level of solution because this is more a stand-alone unit and it is a system so you have several units and a control box, controlling electronics with micro-processors that works on balancing the load over many units so you can actually run them optimised.

What would that be used for?

It is used to optimise the efficiency of the system so it works in an efficient way. Less heat coming out, and lifetime obviously will be longer if you use it optimally instead of running one unit 100% while the other one is waiting. You can balance the load over several units for example and this whole system is integrated with the train management system.

You said rail is about 20% of your business at the moment. Is that going to be much bigger in the future, is it ever going to be a dominant sector for you?

It is not our biggest yet, but it has been growing quite rapidly now, 40% per year for the past 3 years.

One point more about power supplies in general I mean this is actually not rocket science because power supplies I mean anybody can basically design so it is really difficult to make yourself unique and of course the best possibilities is now with the system because it has more and more software inside so it starts to have its own intelligence whereas the stand alone boxes are really stupid boxes, you know you connect some sort of wire to one end and you have another wire in the other end and it just transfers energy from one level to another. But now the systems starts to have some microprocessor which is programmed with actual software so then you can actually start to kind of differentiate yourself from competition and then you integrate yourself deeper with the customers system so then you are not actually replaceable anymore because it takes a year to get a good integration and then you know if somebody wants to go and buy a replacement to you it doesn't work anymore like that because you need to have the same kind of integration to work with the other guy.

What are the most important concepts for you for the future?

Intelligence and integration are the real things because all our other stuff is basically hardware and anybody can do it. Then come the soft things like your attitude, your flexibility, your co-operation with the customers. We have actually in some other areas in the company we are working on an intelligent charger which is actually predicting battery life with some new algorithms. This system will not be in rail but it could be trackside actually. You could have a battery back-up for example in trackside applications, so we are working on a charger which is actually monitoring the battery constantly and making a really good prediction on the lifetime of the battery. This is, if you think about this intelligence and what to talk about there this is something we are working on. It wouldn't probably go on board first, it would probably be some trackside thing first but under the term of intelligence we are working on that kind of thing yes.

Mr Lilja, thank you so much for taking the time to speak with us. We hope you have a successful rest of the show!

Thank you!

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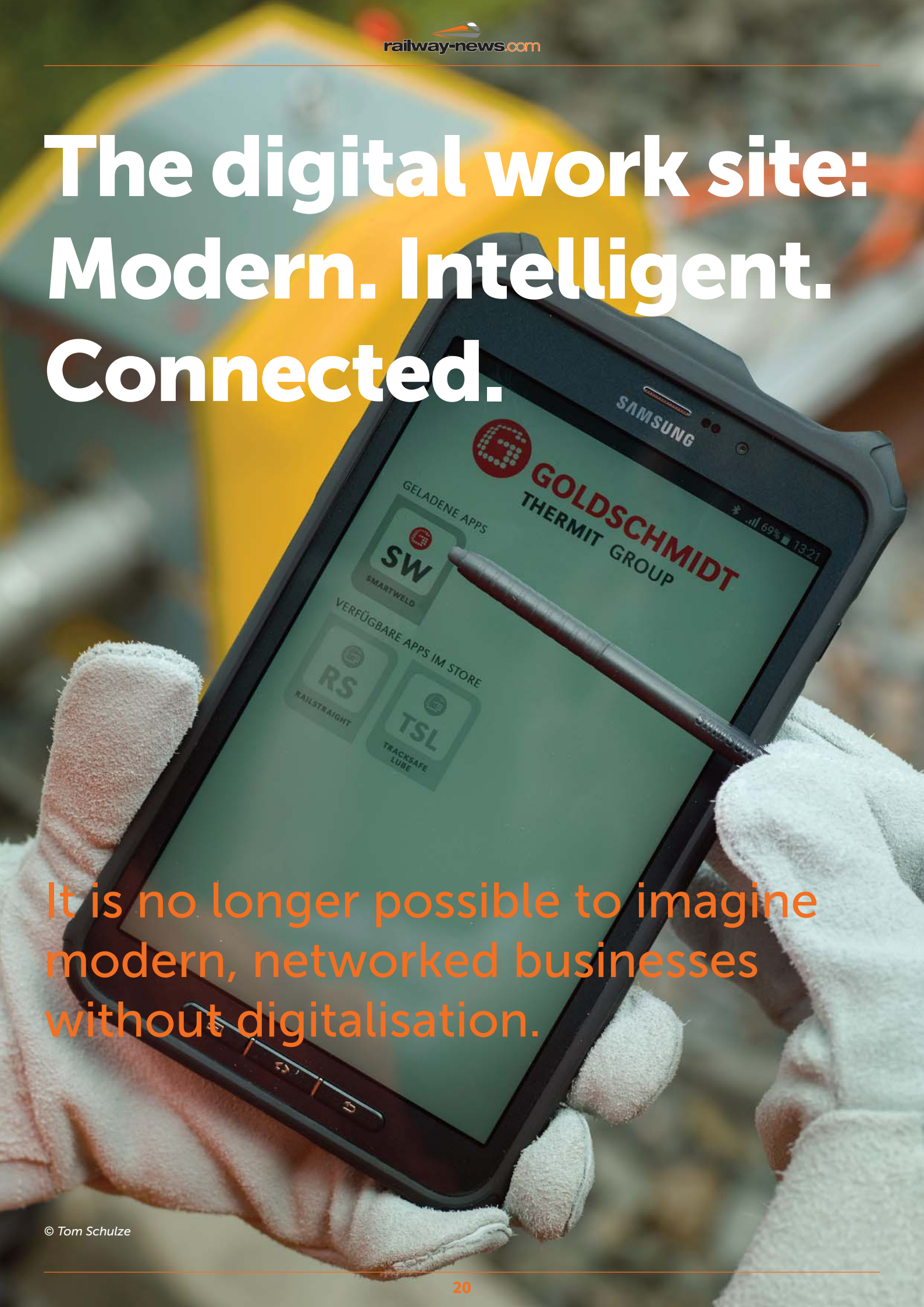

It is no longer possible to imagine modern, networked businesses without digitalisation.

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New standards in quality, safety, transparency and efficiency have increased requirements for the construction and maintenance of railway tracks. In this area, the Goldschmidt Thermit Group sees itself as a pioneer in the service of our customers, enabling progress and growth through the digitalisation of work processes.

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enables convenient and reliable direct access to databases with reference values for numerous types of welding processes.

Our **GOLDSCHMIDT DIGITAL APP** gives you access to all the digital applications of the Goldschmidt Thermit Group. You can use the app on all smartphones or tablets that use an Android operating system.

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* **data transmission via Bluetooth**
* **direct access to references for welds and measurements via database**
* **intuitive user interface**
* **GPS positioning**

The new **SMARTWELD RECORD** for intelligent monitoring and documentation of the preheating process of the THERMIT® weld with the aid of the **GOLDSCHMIDT DIGITAL APP** enables users to document the complete welding process including the traceability and reproducibility of the THERMIT® weld. Using **SMARTWELD RECORD**, the preheating parameters for the THERMIT® weld are recorded and documented via the **GOLDSCHMIDT DIGITAL APP**. The subsequent process steps are prescribed and recorded in a user-friendly and error-free manner for the responsible welder. This results in the ideal use of welding materials and the correct execution of the process to achieve a high-quality weld. The process parameters can be centrally saved and evaluated using the **GOLDSCHMIDT DIGITAL APP**. The **SMARTWELD RECORD** contributes to the documentation of the high quality of the weld.

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TRACKSAFE LUBE, the Goldschmidt lubrication system for improving the wheel/rail contact, has now been connected to a new intelligent control unit. Connected via Bluetooth, the unit enables control of **TRACKSAFE LUBE** via mobile devices and connection to the **GOLDSCHMIDT DIGITAL APP**. This in turn enables the receiving of data and parameters on the device status and saving and export of data and statistics including the dosing settings of the lubricant with the possibility of a quick status query and configuration on site with the setting and receiving of warnings on critical parameters.

The **RAILSTRAIGHT** precision measurement devices, with the variants **COMPACT**, **WAVE** and **DUAL**, allow highly precise measurements of the straightness and surface quality of rails and of the local corrugation of the tracks. They are connected to the **GOLDSCHMIDT DIGITAL APP** via Bluetooth. In addition to the high precision achieved using a micro-magnetic measurement process, the devices also impress through their robust design suitable for use on railway tracks, featuring high mobility, a high-performance internal lithium ion rechargeable battery and automatic calibration at 30-second intervals.

Further information is available online at **www.goldschmidt-thermit.com**.

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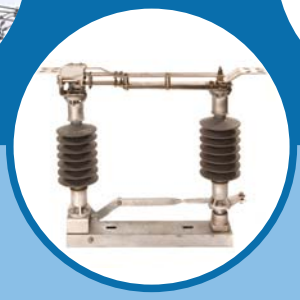

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Simon Archambault of Baultar chats to Railway-News

If InnoTrans proves anything at all, it is that there is a vast myriad of products and solutions that is required for delivering a functioning railway network, all of which come together to make our trains run so that most of us are fortunate enough to take them for granted every day.

By Josephine Cordero Sapién

We wanted to find out more about the unsung heroes of the rail industry so we had a chat with CEO of Baultar, Simon Archambault.

Can you tell me a little bit about your company, Baultar, its history and milestones?

Baultar is a family company. It was founded in 1984 by my father, Bruno Archambault. We are a Canadian company based in the southern region of the province of Quebec. We have two divisions, flooring and seating, both focused on the rail transportation industry. Since the start, our company mission is to develop solutions for our clients through a problem solving approach. We started, back in the mid-80s, by developing an operator seat solution for North American freight locomotive cabs in order to fix comfort and ergonomic issues. We clearly contributed to improving the quality of the cab interior. In 1990, we acquired our flooring technology. During the 90s we worked very hard to position our product in the North American market. We contributed with our higher-value products to change the mindset in the industry: it is better to invest in more durable products that will be economical over the life-cycle than spend money on cheaper but less durable products. Now, after so many years of keeping the same speech, we feel that the market is ready and we are in a position to grow our business.

How many times have you exhibited at InnoTrans? What have been the main positives for you to come out of the show?

We exhibited at InnoTrans for the last 5 editions, including 2016.

First of all, being at InnoTrans is a very good way to have a global view of the mass transit industry. For us it is very important to understand the threats, the trends and look at opportunities. InnoTrans is clearly helping us in that regard.

Secondly, since we have a unique flooring offer, it is a good way to interest new potential clients.

Thirdly, it helps us to understand the different requirements of this worldwide market.

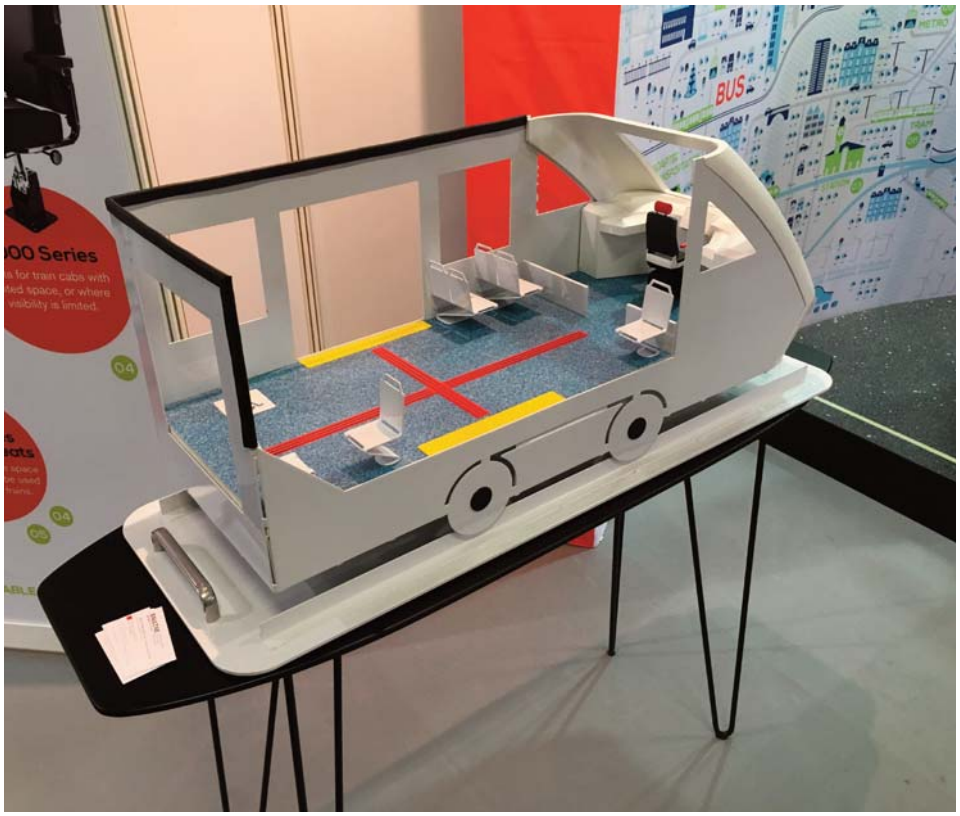
You make both flooring and seating products. What have been your main innovations in these areas?

We developed many new and innovative products over the years. But our main ones are the development of a locomotive cab seat product line; the development of a highly durable complete flooring system that combines the functions of floor covering, structural sub-floor and floor heating (Abrastop FOAM Heating floor); and the development of a new operator seat product line for the rail transportation European market (SITI seat).

What would you say makes you stand out as a company? What factors have contributed to your success?

Our minding that we always have to add more value to our offer in order to satisfy our clients. We do that by being flexible and by mastering our products and technology. All that makes us capable of solving real problems for our clients.

What markets are you currently in internationally? Are there any you would like to expand in?



We mainly focus on the rail transportation market. However, we are looking forward to expanding in the architectural market with our flooring system.

What plans and developments lie in store for Baultar for the future?

We would like to position our flooring and seating solutions in Europe. We are finalizing the development of a new seat (SITI) that meets the European standards. We presented our final SITI seat prototype in Paris and Berlin in 2016. We hope to get our first orders next year.

Can you tell me about some of the key benefits of your products?

Our flooring solutions are highly durable and they will last the life of the railcar. The main benefit is therefore to be more economical over the life-cycle.

Our seating solutions are more robust, more comfortable and simpler. They will better satisfy the users, prevent health problems due to faulty seats adjustments, last longer, and be easier to maintain.

What challenges do you face within the industry?

Mastering all the different requirements of the industry and then adapting our products is one of our biggest challenge.

What has been the standout proudest moment for Baultar?

I think that moving our flooring division into a brand new facility in 2014 was a big moment for the Baultar team. It showed that our team work and tenacity over the years were paying off with results. We needed this new installation after the closing of important contracts.

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Mechan enjoys busiest InnoTrans ever

Visitors to InnoTrans this year were able to see the eye-catching equipment of depot maintenance specialist Mechan in action for the very first time.

A full-size working lifting jack formed the centrepiece of the Sheffield-based manufacturer's display and it was certainly an arresting sight, with more delegates than ever stopping to find out more.

VIP visitors were no exception, with rail minister Paul Maynard calling in for a chat on a tour of the UK Pavilion.

Richard Carr, Mechan's chief executive, said: *"We were really pleased that Mr Maynard showed such enthusiasm for our work. He was keen to learn about our recent design innovations and the role we are playing in key rail infrastructure projects. He topped off a fantastically busy week for us at the world-famous trade fair."*

As MP for Blackpool, Mr Maynard has seen first-hand how one of Mechan's turntables benefits operations at the town's tram depot. He was especially interested in the firm's work with the Intercity Express Programme (IEP) and Crossrail, both of which are specifying Mechan equipment for their maintenance facilities.

Mechan's stand, complete with working jack, at this year's InnoTrans.

Express Deliveries

To date, Mechan has supplied five sites associated with the Department for Transport's IEP project. Its most recent orders came from the Rail Innovation Development Centre near Melton Mowbray in Leicestershire, where the new high-speed trains are being trialled.

Working with civil engineers Construction Marine, Mechan designed and fitted a bespoke

One of the bespoke traversers built by Mechan for Hitachi's Newton Aycliffe facility.

bogie bridge that spans the width of an existing bogie drop pit, improving vehicle access into the rail shed. It also provided Network Rail, operators of the centre (formerly known as the Old Dalby Test Track), with eight 25-tonne mobile lifting jacks with moving anvils, to enable the incoming IEP trains to be assessed fully.

The jacks will work as one synchronised set to give the facility the extra capacity to accommodate longer vehicles. Using Mechan's patented Megalink controller, any number of units can be linked together via a single cable and operated by just one person from a portable, touch screen HMI panel. It provides constant feedback on the lift, records information about usage and faults and offers impressive power savings.

Calls for Mechan's equipment and expertise have come from all areas of the IEP and the firm has already delivered lifting jacks and equipment drops to the Stoke Gifford and North Pole maintenance centres, plus a pair of 80-tonne traversers to Hitachi Rail's vehicle manufacturing facility in County Durham.

Mechan's jacks in operation at the High Output Operational Base near Swindon.

Traversers are a perfect example of Mechan's bespoke engineering skills. No job is too large or small and a completely individual design can be produced to meet workshop constraints and vehicle requirements.

The two Newton Aycliffe traversers were developed to move carriages between 33 tracks inside the plant and out to the test area. The internal unit was specified with a customised low-profile design and four-metre hydraulic ramps, to allow traffic to pass through the traverser pit. The external installation has a more conventional construction, but was fitted with a canopy to protect Hitachi's vehicles from the elements.

A three-road equipment drop, 40 lifting jacks and two bogie turntables are currently in production for the IEP depot being built in Doncaster. Bogie handling is another specialist area for Mechan and its versatile equipment drops are becoming increasingly sought after, as they make bogie change feasible within two hours.

New depots are not just being erected to care for the IEP trains, but also the vehicles responsible for carrying out the necessary line upgrades. Mechan has supplied a further eight 25-tonne lifting jacks to Network Rail's GBP seven million High Output Operational Base near Swindon. They will be used at the behind-the-scenes facility to maintain the 23-vehicle High Output Plant System, responsible for installing overhead electric cabling along the mainline route.

Crossrail Collaboration

One of Mechan's largest contracts of the year came from the capital's Crossrail project.

The firm was asked to produce more than GBP one million of maintenance equipment for the new eight-road Old Oak Common depot in northwest London, which will accommodate 33 of the 66 trains being introduced to the local rail network.

A set of 30 lifting jacks, five bogie turntables and a three-road bogie drop have been commissioned by Bombardier, who are building the depot, supplying the trains and maintaining them, once the project is complete. Mechan will be fulfilling the order in two stages, with an initial batch of products scheduled for installation before the end of this year. The remaining items will be delivered early in 2017, before the first trains arrive in May.

Working with VolkerFitzpatrick, Mechan also designed and built a 130-tonne, two-road traverser to suit the tight confines of Crossrail's Ilford facility, enabling vehicles to be manoeuvred around a new paint shop. Due to the limited space available, it was not possible to use sidings to transfer carriages from the shot blast bay to the paint booth, so an alternative was required.

Having collaborated on a similar project at the Port of Felixstowe, VolkerFitzpatrick knew Mechan had the technical know-how to create a suitable solution to its space issues. The 28m long traverser was constructed and tested before being disassembled and moved to site in components small enough to fit into the Ilford facility. It was then rebuilt on site and proof tested to carry loads of 162 tonnes, before entering service.

Mechan's traverser at work in the Ilford facility.

Richard Carr added: *"We are enjoying a steady stream of orders from these two high-profile projects and our work is by no means complete. Further equipment is in the pipeline for Ilford, including jacks, bogie turntables, a lift table and two electrically powered shunters from our European partner, Zwiehoff. We're also looking forward to continuing our relationship with all partners involved in the IEP, particularly as the new Doncaster facility takes shape on our doorstep."*

For more information about Mechan's InnoTrans success, or its wide range of depot maintenance equipment, telephone **(0114) 257 0563**, visit **www.mechan.co.uk** or follow the firm on Twitter, **@mechanuk**.

The lifting jacks and equipment drop delivered to London's North Pole depot.

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Parker Hannifin demonstrate total solutions approach at InnoTrans 2016

Parker Hannifin, the global leader in motion and control technologies, demonstrated an expansive range of technology solutions at this year's InnoTrans rail exhibition in Berlin.

During the show, Parker displayed a wide range of components and solutions from multiple technologies, including pneumatics, electromechanical and fluid control solutions engineered to meet customer requirements and help drive advancements in the rail industry.

With Parker's focus on developing solutions for customers' needs, the exhibition provided the perfect opportunity for their experienced team to meet with customers across Europe and to learn more about their needs and requirements for the future.

InnoTrans 2016 saw Parker concentrate on their total solutions approach, showcasing products found in all areas of the rail vehicle. These included 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, door mechanisms and couplings. The company's range of rugged hoses and connectors designed and approved specifically for use in rail applications were also on display.

Parker would like to thank all of the visitors who came to their stand for their interest and support. For further information on any of their solutions for the rail industry 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**.


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Independent engineering services from A to Z

There is growing awareness of engineering service providers who assist different industry players to create forward-looking mobility solutions, also at InnoTrans 2016.

One industry – **Plenty of interdependent needs**

The complexity of the railway industry is reflected in the multiplicity of needs of the different industry players. On the one hand, vehicle *manufacturers* need help with the development of components or whole systems or they ask for support in performing a variety of measurements in the field of railway vehicle technology and operation or along the homologation process. On the other hand, railway *operators* seek strategic guidance in fleet management topics or need active support in the procurement of new vehicles from bid evaluations to supervision of the manufacture or in the modernisation of existing vehicles. *Authorities* also rely on the knowledge of consultants who provide expert assessments of all kinds of technical rolling stock issues such as structural strength and durability, running dynamics, safety, fire protection, and noise and vibrations. Last but not least, *maintainers* count on the expertise of advisors as regards maintenance methods, depot layouts, equipment and software. These are only a few of the needs expressed by the industry players.

A prerequisite for neutrality – **The independence of the consultant**

To deeply understand all these different and interdependent needs, one must be familiar with the market dynamics and have proven experience in facing these challenges from different perspectives. In addition, the independence of the advisors is a fundamental characteristic in order to create smart solutions that exceed expectations.

Everyday life teaches us that the consultant does not always have the same interests as the customer he advises. That is exactly what the economic principal-agent theory tries to explain: a dilemma arises when a person or a company (agent) is able to make decisions that impact another person / company (principal). Independence means that a company does not belong to external shareholders, but only to its own employees. When no third parties are involved, a company is motivated only to act in its own best interest and in the best interest of its customers.

PROSE – **The independent mobility solutions provider**

PROSE is employee owned, this let us guarantee independent and neutral engineering services. We work for our customers and ourselves - and no one else. Our customers - manufacturers, operators, authorities and maintainers - trust us to deliver total solutions to complex challenges. These solutions often involve several service fields. PROSE was founded in 1982 and is an independent mobility solutions provider, which is mainly active in the rolling stock engineering field and serves global customers from its offices in Denmark, Germany, Italy, Sweden and Switzerland.

InnoTrans 2016 was an important step for us as we had the opportunity to present the new PROSE and our enriched portfolio, which enables us to deliver engineering services from A to Z. We were able to convince customers by presenting our most recent product innovation, the BrakePASS, and by exhibiting the bogie we developed for the Wuppertal suspension railway. At InnoTrans 2016 we experienced an inspiring atmosphere, in which we visited our established customers and met new potential customers. Our meeting rooms were always booked and our agendas busy!

Efficient and safe brake tests – **The brake test assistant "BrakePASS"**

Our product innovation BrakePASS assists railway operators with automatic, accurate and centrally saved documentation of the brake tests. The system is composed of three elements: the *test head*, which documents the pressure in the brake pipe, the *app*, which is the user interface, and the *central database*, which stores all the recorded information about the performed brake test.

Railway operators can benefit from these **advantages**:

- *low implementation costs* - unchanged brake test procedures and minor training effort
- *automatic operation* - the user only needs to start and stop the brake test
- *enhanced safety* - increased reliability of the brake test
- *increased acceptance of the results* - accurate documentation and objectively verifiable data

Thanks to the user-friendliness of the system and the added value that the system provides during common brake tests customer reactions to the BrakePASS have been very positive so far. Visit **www.brakepass.one** to find out more about the advantages of the system.

The BrakePASS system

New vehicles for the Wuppertal suspension railway

A unique "turnkey" system – **The Wuppertal suspension railway**

The general contractor Vossloh Kiepe entrusted us with the comprehensive mechanical design and the system integration of the new vehicles for the Wuppertal suspension railway.

As the new vehicles for the suspension railway had to be compatible with the existing infrastructure, PROSE developed a vehicle body that is assembled from aluminium extrusion profiles, so that the end vehicle body only weighs 5.4 tons. To meet modern passenger requirements, we realised a continuous row of windows conveying a dynamic appearance, which offers a bright and comfortable ambience to the passengers.

This unique system is one of our turnkey projects. By "turnkey" engineering we mean that we can deliver all documents required for the manufacture, the maintenance, the acceptance and the operation of rail vehicles. The manufacturer (also manufacturers of machines or non-rail vehicles who want to enter the railway market) can concentrate on building vehicles while we do the engineering and develop all necessary documents.

The successful running tests of the new vehicles were performed recently. It is the intention to put them into operation within the next few months.

The key to our success – **It's all about having the right people on board!**

As a mobility solutions provider our most important resource is the people that make all this possible! We have more than 200 dedicated, experienced employees worldwide. In our daily work, we honour commitment by delegating responsibilities and decision-making. This gives each of us a strong feeling of ownership of our projects. It makes us willing to go the extra mile. Our corporate culture encourages each of us to be inventive, resourceful and efficient. We do not shy away from difficult discussions or decisions, but enter them with respect for all parties involved and with the project's best interests in mind.

Learn more about our 30 years of experience and our over 3000 successful projects by visiting us at **www.prose.one** and by subscribing to our **newsletter**!

PROSE

PROSE's international engineers

On Display at InnoTrans 2016:

The Riyadh Metro Vehicle by Siemens

By Josephine Cordero Sapién

One of the many vehicles at the Outdoor Display at InnoTrans 2016 was the metro vehicle, type Inspiro, by Siemens, intended for the Riyadh metro, following an order received in 2013. This is the biggest urban rail project currently under construction in the world and with a population of more than six million, the city is in urgent need to improved public transport to alleviate congestion and keep the population moving.
Unveiled for the first time in February of this year, these 2 and 4-car trains by Siemens are perfect for the extreme climate of Saudi Arabia.

These metro vehicles are only part of Siemens's involvement with the Riyadh metro project. The company has also been commissioned to deliver electrification and signalling systems.

Siemens's Riyadh metro will run on lines 1 and 2. Delivering 74 of these metro trains in total, Siemens designed the car bodies to be 100% aluminium and suitable for standard gauge track. These vehicles' top speed is 90 km/h. Features that make this Inspiro-type vehicle perfect for the region's climate are the powerful air-conditioning and special fittings on the bogies, traction drive, brakes and doors to prevent sand from entering.

The Riyadh metro will feature a total of six lines and is scheduled to run in 2018.

Line 1, the Blue Line, will run in a north-south direction. It will be mostly underground, while sections will be elevated on a viaduct at either end of the line. The length of this line is 38 kilometres and will feature 22 stations.

Line 2, the Red Line, will run in an east-west direction, to King Saud University. This line will run above ground along a freeway. The total length of this line will be 23.5 kilometres and have 13 stations.
To learn more about the impressive Riyadh Metro project, please read our interview with Jaime Freyre overleaf.

© Messe Berlin

Riyadh Metro

Riyadh is the capital of Saudi Arabia and also the country's largest city, with a population of more than seven million.

One of the challenges all big cities face is moving its people effectively and public transport has a huge role to play here. The Riyadh metro is among the most ambitious infrastructure projects taking place in the world today. When it opens in 2019, it will be cutting-edge, with driverless trains, a state-of-the-art signalling system and sleek, beautifully designed stations. It is a logistical feat, with an international team working on more than 100 sites to construct 176km of track, connecting 85 stations, to produce a public transport system fit for this capital's future.

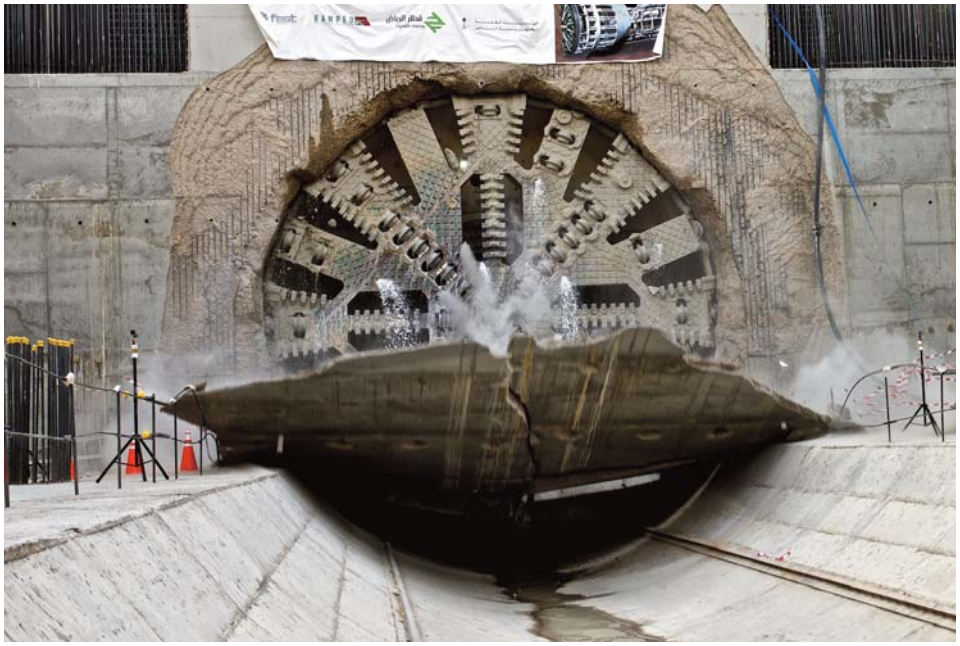
To find out more about this exciting project, Railway-News spoke to one of the project's leading figures, Jaime Freyre, CEO of FCC in Saudi Arabia and Project Director for the FAST Consortium on the Riyadh metro.

What is the necessity of the Riyadh metro?

With six lines, 85 stations and a total route length of 176

kilometres, the Riyadh metro is being developed by Arriyadh Development Authority (ADA) – the executive arm of the High Commission for the Development of Arriyadh – in partnership three international consortia.

The Riyadh metro will transform the way people move around the city. It has been designed to form the backbone of the public transport system in the city, with a network that will cover most of the densely populated areas, public facilities, and the educational, commercial and medical institutions. Its delivery is essential to a city that is expected to grow from 5.7 million inhabitants today to a projected 8.3 million by 2030.



What portion of the works was FCC responsible for?

FCC is the leader of FAST Consortium, which comprises of Samsung C&T, Alstom, Strukton, and Freyssinet. Throughout its 110-year history, FCC Construction has worked on projects covering civil works, building, refurbishment and industrial works construction. This includes significant experience in the rail sector, building hundreds of kilometres of high-speed rail lines, as well as metro lines in North and South America, Europe and the Middle East.

As part of FAST Consortium's venture, FCC has mobilised highly experienced and talented crews from its global offices and sites to work on the Riyadh Metro Project. For example, the FCC team which is responsible for operating the tunnel boring machine (TBM) and the excavation for the Green Line collectively has over 50 years' of tunnelling experience. Each operation was supported by 23 technicians working inside the tunnel with the TBM, replicated across three separate shifts, and around 100 personnel supporting the TBM from the outside.

FCC are also responsible for the production and installation of more than 11 km of viaducts through pre-cast beams and decks solutions. Furthermore, we are responsible for the mechanical, electrical and plumbing (MEP) work on both the Green and Purple Lines.

What challenges did the construction process present (climate, sand ingress, etc.)?

This mega project, commissioned by ADA, is being built by three consortia and comes with its own set of challenges. For example, in the case of our FAST consortium, building the Yellow, Green, and Purple Lines with 62 km of track and 25 stations in 60 months is quite a challenging task. Ensuring as little disruption to the daily lives of 5.7 million inhabitants as possible is a major challenge. We

have had to deliver utilities for construction works, we have detoured some of the busiest roads in the city, and we have had to co-ordinate activities across more than 100 sites, including stations, depots, and offices – where the work is being constructed simultaneously.

We have also had to gather accurate information about the soil, utilities, and location of the stations, which was challenging. However, with the help of our client, ADA, we have managed all this. We have also made sure that we are engaging with the community by distributing information and arranging site visits to answer any questions or concerns that they might have.

How were these challenges overcome?

Collaboration: ADA's collaboration has been a key factor. Their guidance and co-ordination is key to our success. Their role was to be the conduits with more than 22 government agencies and private agencies affected and related to the metro project.

Defining a single strategy: FAST has been created by five companies which were selected based on capability, strategic goals, and value potentials. Using these criteria allowed us to build a single strategy and common approach. This is centred on trust, leading by example, communicating openly and discussing issues. Through trust, ADA and FAST have forged a strong relationship, which will help to ensure the smooth and successful delivery of the project.

Communication: Our consortium includes 9,500 personnel with 42 nationalities and 22 different languages. In order to build trust, both internally and externally, our communications department and the leadership team always have been clear about the need for open and transparent communication with everyone involved. In particular with ADA, with whom we have communicated very clearly from the outset. This relationship has been allowed us to succeed in becoming the first to start and finish tunnelling works on the Riyadh metro project.

Community Engagement: ADA and FAST have consistently engaged with the local community by inviting them to visit the engineering works that were going on beneath their feet. By hosting two visits from various schools and colleges to witness first-hand the TBMs working under their homes, FAST opened the eyes and minds of the visitors to the wealth of opportunities that a career in engineering might hold. They saw real works, done by real people, in a real time; they asked questions and took photos, knowing that the next time they would be down here, they would be with their friends and families, holding a ticket in their hands and travelling across the city.

What signalling system will be in place?

Urbalis CBTC signalling system will be provided, the trains will be 100% driverless and use the latest communications-based train control (CBTC) technology as well as the power supply and Alstom's energy recovery system Hesop. All sub-systems have been optimised together to reduce energy consumption.

What rolling stock and operator will be in place?

69 driverless Metropolis trains for the Riyadh metro project for the Yellow, Green, and Purple Lines are composed of two cars per set and are each 36 metres long. Each train features three classes: first, family and single class.

Metropolis offers a large range of options and configurations, a high level of passenger comfort and innovative features to optimise the energy consumption and the life-cycle costs.

The driverless trains will offer passengers a high level of comfort, ergonomic seating, LED

lightning, air-conditioning and advanced passenger information systems.

When will the metro open?

The project is scheduled to be completed by 2019.

Are there any special moments that made working on the project particularly notable?

There are two special moments to me personally. The first was when the excavation work ended the Green Line's 13 km tunnel. We were the first consortium to start tunnel excavation in the Riyadh metro project, the first to use a TBM in the Kingdom and the first to complete tunnel works on the Green Line.

The second was when we were joined by the residences of Salah Al-Din district to be part of the ceremony celebrating our TBM named San'ah breaking through and reaching its first station. This occasion was celebrated by both FAST Consortium's employees and the citizens of the local area who were invited by ADA to celebrate this historic experience. Their presence reinforced the role they are playing to help deliver this mega project in Riyadh. The citizens of Salah Al-din district witnessed how the machine's cutter head broke through the walls of the station, which is 25 metres deep, and commemorated FAST Saudi engineers who operated the machine coming out of the tunnel. It was a proud moment for all of us.

What is FAST's plan next?

The plan now is to prepare the consortium to start integration of the MEP, track, systems, and rolling stock work on time. We also need to co-ordinate with future operator and maintenance companies, and finalise the Transfer of Technology programme.

ADA has recently launched, in collaboration with FAST, a 10-week summer training programme, which includes rehabilitating national cadres, in engineering disciplines and preparing them to work, in the project, during operational stages. The summer programme is targeting Saudi graduates, in the disciplines of civil engineering, electrical engineering, mechanical engineering and architecture, in co-operation with Saudi universities.

Optimised and systematised vehicle measurement

schenckprocess

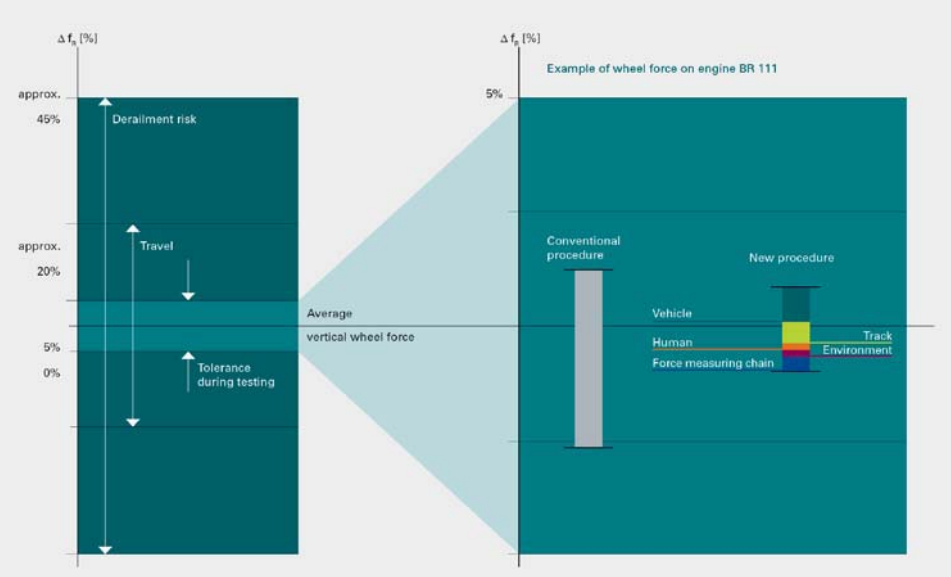
For quality improvement in rail vehicle construction

Optimized and systematized vehicle measurement for quality improvement in rail vehicle construction

Innovations in the rail industry have to impress rail passengers. Only then does innovation have a real purpose. The requirements are obvious: Better punctuality, less noise, greater availability, better capacity utilization, lower energy consumption. Not to mention improved comfort, reliability, and of course maximum safety and value for money. It sounds simple, and it basically means a demand for improved quality of existing possibilities.

From the development process to production, maintenance and field-based monitoring, the measurement of geometry data and forces plays a crucial role. Vehicle manufacturers, infrastructure and rail operators and maintenance companies perform measurements every day, sometimes recording huge volumes of data.

Measurement uncertainty of vertical wheel forces



While measuring geometry data is an everyday occurrence, measuring this data and changes in geometry under load is a much more challenging task. Yet it's only the combination of force and geometry information that can provide reliable data, for example relating to the anticipated comfort of travel or for estimating the degree of derailment protection. In the workshop, this is increasingly becoming standard practice. In the bogie pressure measuring stand or when measuring corner load or vertical wheel force, force and geometry are measured simultaneously, so the issue of deformation under load and therefore the effect on load distribution is taken into account.

On the track, force measurement still takes priority because the simultaneous measurement of

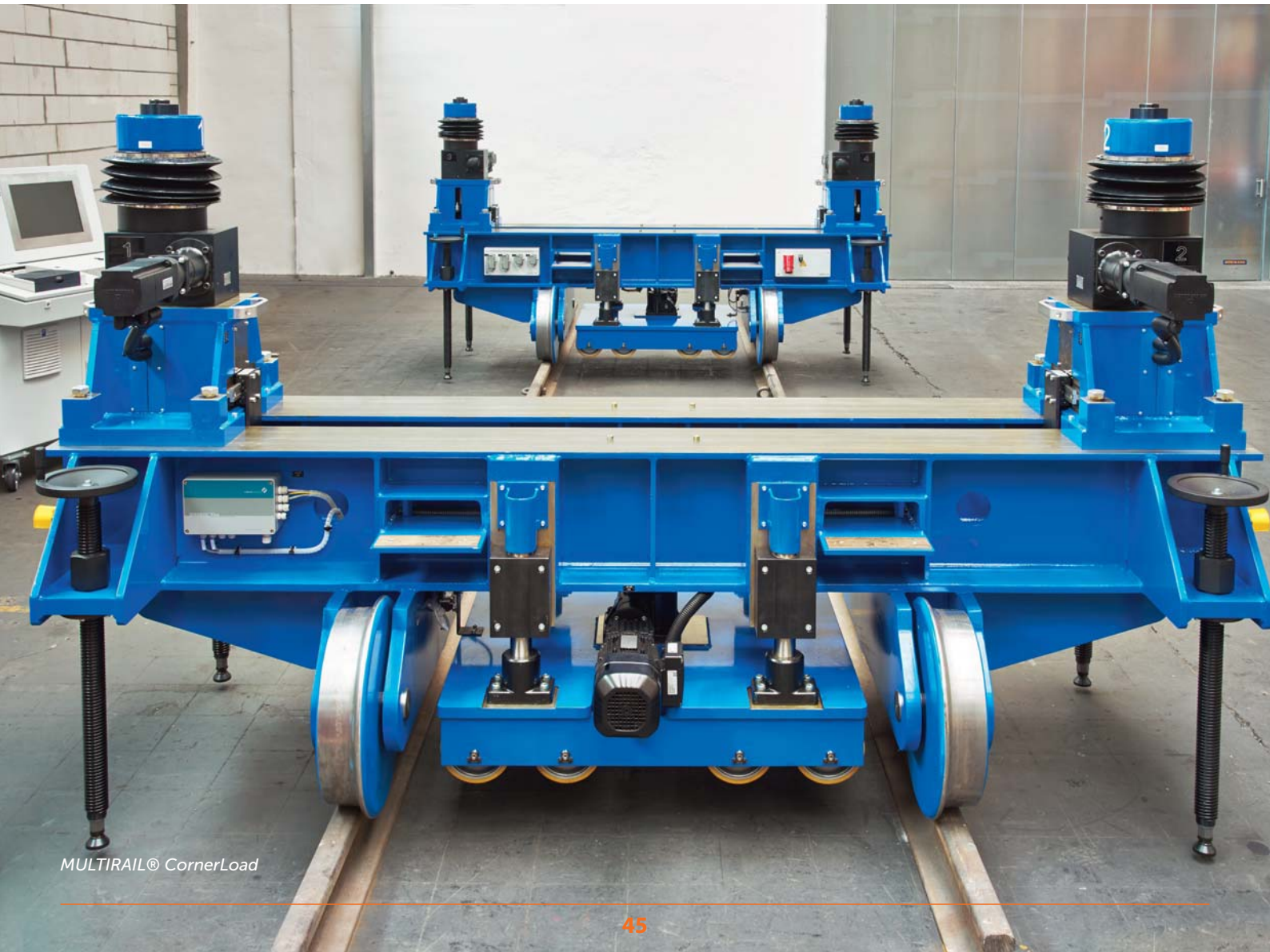
geometries from outside – on the vehicle or indeed on the deformed track – is no trivial matter.

And finally, field-based systems allow vehicles to be monitored during operation. This means that unusual load distributions or unusual dynamic loads (e.g. of out-of-round wheels) can be detected promptly and in good time. Condition-based maintenance becomes a reality. For the most part, vehicle manufacturers, infrastructure and rail operators and maintenance companies work independently of one another. Each party has its own aims, measuring methods, databases and evaluation procedures. Some of these methods and data are completely different, which includes the measurement errors, verification methods and calibration procedures.

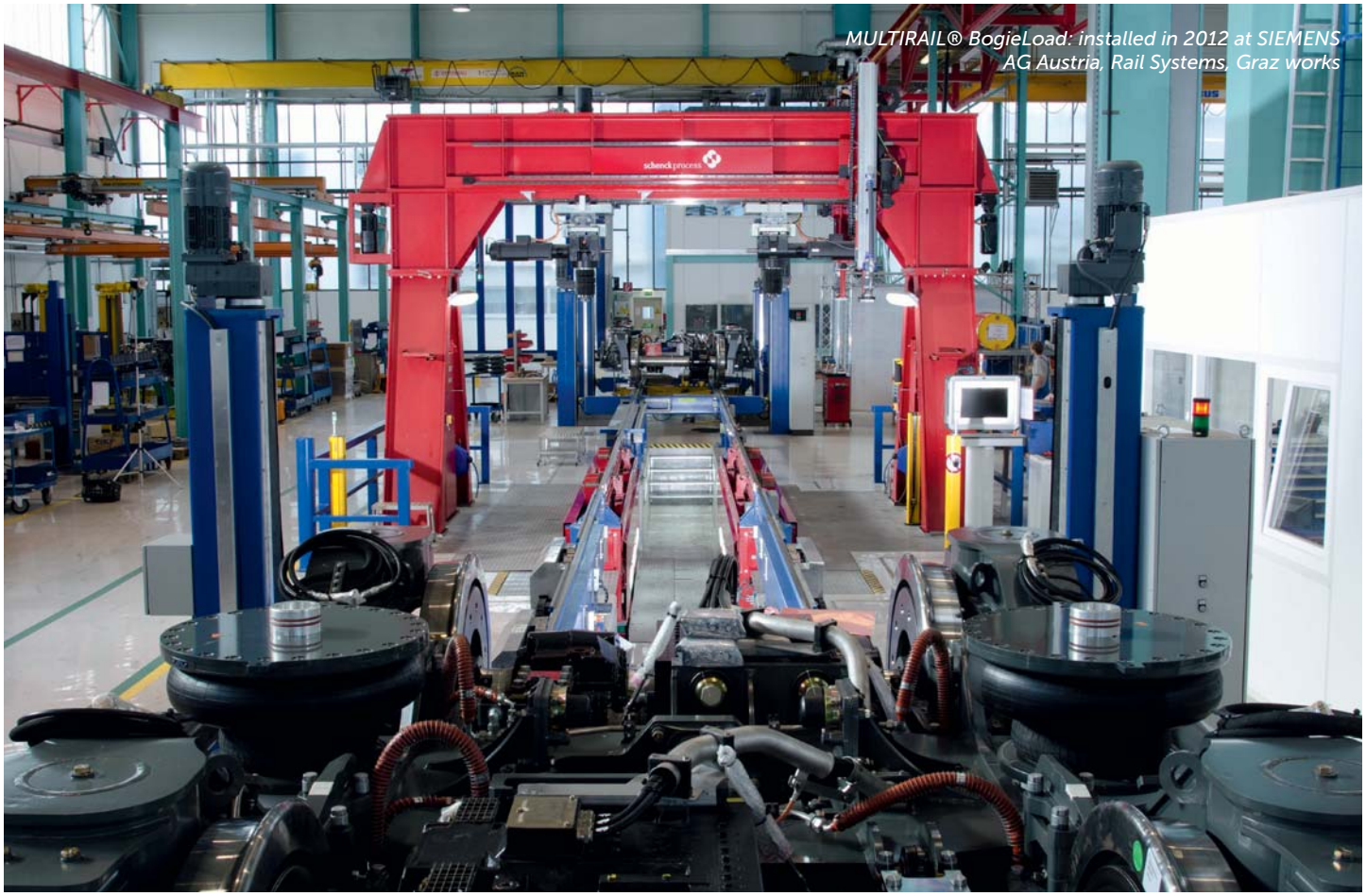
What would happen if more exchange of data and knowledge took place in the rail industry?

Here is an example of a vehicle manufacturer which systematically optimized its measurement technology by using field- and track-based data. When recording vertical wheel forces, it's essential to calculate the (overall) measurement uncertainties.

With the previous, conventional approach, the status of the process measurement uncertainty was unknown. The vehicle was weighed statically, one axle at a time, on a singular wheel force measurement device, then weighed dynamically in the second step and the wheel forces were calculated. Only the level of the measurement track and the measurement uncertainty of the force measuring device were verified by means of a reference load cell. This was done without consideration of the vehicle influence, i.e. the interplay between the measuring system and the vehicle system. Other influences caused by the operator, weather, temperature, track configuration and so on were also not taken into account. The variations within several series of measurements (reproducibility measurements) were



MULTIRAIL® CornerLoad



MULTIRAIL® BogieLoad: installed in 2012 at SIEMENS AG Austria, Rail Systems, Graz works

correspondingly high, not explainable, and unsatisfactory.

By examining the operating data of network and vehicle operators, the vehicle manufacturer was able to very quickly develop a completely new measurement concept. Instead of singular measurements, the individual wheels are now recorded several times during the slow transit (a process referred to as 'quasi-static' measurement). The measurement points are distributed over a defined area of track. This allows a wide range of conditions relating to the interaction of vehicle, track and measuring equipment to be recorded, fully corresponding to later operational use. The vehicle passes over the measuring system in both orientations and both directions of travel. For each wheel, this means an averaging of 4 (journeys) × 8 (measurement points) = 32 measurements.

The reproducibility variations between the specific vertical wheel forces of a wheel is now the measure for the measurement uncertainty of the overall process. In the new measurement process, in addition to level under load and the static measurement uncertainty of the force measuring device calculated with the reference load cell, the quasi-static measurement uncertainty in interaction with the vehicle is therefore also verified in relation to the vertical wheel force through the 'vehicle rotation test' (changing the vehicle's direction of orientation). The measured value is returned through the (statically measured) total of the vertical wheel forces of the tested vehicle (corresponding to the vehicle mass). This remains constant (within the specified tolerances) despite the changing vertical wheel forces / vertical wheel force distribution.

The example described above illustrates how essential its success is to the vehicle manufacturer, but there are also fundamental benefits when consistent measurement data is used across the board, up to and including the adaptation of a complete test process.

When approval authorities, vehicle developers, vehicle manufacturers, train operators and workshops work closely together, share data and to some extent analyze and interpret data together, then improved quality in rail vehicle construction becomes a competitive advantage for all stakeholders, but above all, rail travel becomes more attractive to all of us.

www.schenckprocess.com

schenck process

we make processes work

Schenck Process's track-based systems reliably measure the safety-relevant load status of trains and reliably detect force impacts, which might be triggered by defective wheels. Precise measurement and calibrated weighing? We provide the basis for calculations in relation to internal check weighing and legal-for-trade weighing for individual wagons and train sets. Quiet, comfortable and low-wear rolling stock is the result of intensive development work. Schenck Process supports vehicle manufacturers and maintenance workshops with reliable measurements in the context of bogie testing and corner load measurement. **www.schenckprocess.com**

DERAILMENT PROTECTION

TRADE & TRUST

WORKSHOP TEST EQUIPMENT

BestMile

A major factor in keeping rail successful and competitive in our mobile world is not to see rail in isolation but as a vital component in intermodal transport, both for passengers and freight.

By Josephine Cordero Sapién

Here at Railway-News we've always taken a keen interest in pushing innovation in the rail sector and to give a voice to start-ups with new, impressive ideas that will hopefully develop to give us the smart, efficient, green door-to-door transport system the industry is working towards. As a result we swung by the Future Mobility Park to chat with BestMile and learn about their story.

Can you tell me a bit more about what you do and about the background of BestMile? What made you come to InnoTrans?

Maud Simon: Ok so I will start with the background on BestMile and then let you know why we came here.

So BestMile has been incorporated in 2014, it is a spin off from the Swiss Federal Institute of Technology in Lausanne. So the way it was created, basically the EPFL (ed.: École Polytechnique Fédérale de Lausanne) applied to host a European project on autonomous mobility and the two co-founders worked on this application; one for the EPFL and another one through Anne, who was at the time in an urban

Smart Shuttle

planning company. So both of them worked together to help the EPFL in this application to host a project. When the EPFL found out that they were selected to host a project they realised, ok we're going to have six autonomous shuttles (AS) for six months. How are we going to operate them, who can help us to make the best out of this opportunity and then they realised that there was no one who knew how to make AS transport services. So based on this fact, the two co-founders funded BestMile to initially manage the project, the European mobility project, within the EPFL for the six months. In the meantime, before actually managing the project, they got another European project to manage. It was a project that lasted a couple of months with only three vehicles. It was a very basic project at the time though we didn't have any technology because it was even before the big European project that BestMile was created for. The small European project is called CATS and the other one, the big one, that they were created for is called City Mobile 2. It was a huge project where I think 12 cities in Europe was to receive the AS and had to make the best out of it. It was also to see how people reacted to autonomous mobility, what they were willing to pay to use AS instead of buses, what were their criteria to choose autonomous mobility instead of regular mobility. So with these 2 projects BestMile managed to be self-funded for the first two years. It's actually during the second project that we had the first version of our platform. And what the platform does, so it's a fleet management platform for autonomous vehicles. Basically the transport operator mobility provider puts in its constraints, for example 'from 9–10 I need 10 buses on line one'. And then the platform received all the data from the autonomous vehicle, i.e. its speed, position, battery level, and any relevant information so it can be also information from a temperature sensor inside the vehicles. It takes all this information and will despatch the right vehicle at the right place at the right time to answer to the demand in the most efficient way for the public transport operator while offering the best level of services for the customer. Because, you see autonomous vehicles by themselves they can avoid obstacles and drive themselves but at some point you need to take that to the next level and actually use it as a transport system so you need them to respect schedule and to adapt to network changes. If one shuttle is delayed because of something on the road the other one needs to adapt so that you keep the frequency smooth and going. Most of the AS we also have today are electrical, so we need to handle the battery management because you don't want to be sending an autonomous vehicle that won't be able to fulfil its mission because it will run out of battery. Some people say battery management, that's easy – when the shuttle is out of battery just put it back on charge but you don't just put it back, it has to drive itself back to the charging station. You have to be able to charge all of your shuttles without disrupting the network. So, that is a pretty complex problem and if you add that to the already complex problem of optimising the complete network, this is a lot of work that the platform has to do. So it uses an algorithm that we have developed in-house but also with the help of the Swiss Federal Institute of Technology. So we have people developing the algorithm in-house but we also have three mathematicians from EPFL who work on improving the existing algorithm and maybe make them more efficient in certain use cases specific to autonomous mobility for public transport or autonomous mobility for on-demand services like car sharing or ride sharing companies.

So at the moment you are using this just on road vehicles?

Yes, now it's just on road vehicles, not really on trains.

Do you think your platform has an application for trains?

For trains, maybe not, I think there is a lot of fleet management solutions for trains. I've actually talked to someone from SNCF who are developing algorithm? for train management. So, this is not something that we actually pursue actively but we have actually been reached out to by a lot of train companies because some of them are studying public transport in general.

So door-to-door mobility?

Yes, exactly, one application is that if we are connected for example to the train information system then you can sync when the shuttle can pick up people from the train station and sync to the trains. We are also working on simulation tools. That could be applied to trains because it is just a matter of simulating how many vehicles you need to ensure demand and so that could be applied to train but this is not something we pursue actively right now because we are still...

Little?

Yeah! We're 25 so it's a big start up but still not a big company.

25 employees?

Yes, 25 employees. We are a pretty big team for a start up but still not a sufficient team to work on different directions. But we've been in touch with a lot of railway companies because they are interested. We've been in touch with SBB, DB, but DB do so many things so they're interested in different areas, but they are interested!

Yeah I like the idea that you could programme your shuttles so that if you know that your train is delayed, then you can delay the shuttle or if you know that the train is full if you've got that data, then maybe you have 2 shuttles.

Yes exactly, what we want to do is to run global optimisation to really have a connected network with all the transport modes to have an efficient transportation system. There is so much optimisation that can be done even with the regular transportation system today if we had the right people with the right information. So for us it's really important we really want our platform to be connected so as to have as much information feed as possible. For now it's the vehicles, the information from the transport operator, we want to integrate traffic information so if there is a traffic jam we can dispatch the vehicle accordingly, to re-route them in an efficient way, to pick up the people at the train station at the right time so the shuttle doesn't wait for 10 minutes and the people don't wait for 10 minutes as well. Also, so we have to be connected to the regular transport services, the regular tram, the regular trains the regular buses and yes this is something that is really important to us because we don't want to be just optimising such a tiny part of the transport system we want to try and be integrated in the existing network and try to make the best out of it and re-offer and optimise solution and improve mobility globally.

So I suppose the biggest application for you is urban transport, because with growing population sizes and cities and traffic jams everywhere, the more autonomous or driverless or clever, intelligent, smart transport you have, including keeping people on the rails and therefore off the roads, that's a big area but do you do things more 'long haul'?

I guess so but it's true that for today we are really focusing on public transport because like you said autonomous mobility has the power to make public transport really attractive compared to services like Uber because with autonomous mobility you gain so much flexibility. Regarding intercity transport, yes there is an application, we've never really thought of it as a different category.

It's impressive that your autonomous vehicles drive on regular roads. They obviously must take other cars into account?

They do. So far everyone has been safe in the city! But the shuttle doesn't, they drive at about 20kmph so it's good for pedestrian streets. You wouldn't want a car that drives really fast in the middle of pedestrians but even in the city centre most of the time you don't drive faster than 30kmph so it really goes unnoticed. In the beginning the people were like 'oh what is this yellow thing' but now they don't even pay attention to the shuttle anymore.

OK, they've learnt how to behave?

Yes, oh some people just try to jump in front of it to see if it will stop!

Will it!?

Well it does! So far it does!

Did that really happen!?

Yeah well they try!

Because they are curious about the technology, they're 'interacting'?

Yes! And since they see that the shuttle is not driving that fast they don't feel threatened if it doesn't so they just jump in front of it to

see if it will stop. But then you also have people who really don't pay attention and just walk in front of it without even noticing it's there. Everyone is safe! But in Switzerland you have a law that says that every village that is more than a certain number of inhabitants needs to have access to public transport and so most of the time this is the main Swiss public transport operator called PostAuto, or PostBus in English. They are the one handling this type of um, really in the countryside as well so they are handling public transport in the city of Sion where they have the test and they are also handling a lot of countryside public transport. For them autonomous vehicles are a really interesting solution even in remote areas because first you don't have huge buses that are half empty most of the time and for example we also work on on-demand services even for public transport. With autonomous vehicle they have the flexibility to offer a vehicle when the people actually need it because you don't have to pay a driver to wait around. You can just dispatch the vehicle whenever it is actually needed so it's more efficient in terms of cost for the transport operator and it's more efficient for the passenger because he has a shuttle when he needs the shuttle.

I like this law because the cities get attention for investment and technology and development and infrastructure and people who live outside of cities because they don't get access they almost feel more pressure to also move to the city. So if you want to keep people living where they are living and be able to function the same way that

CoFouders - RaphaelGINDRAT and AnneMELLANO

you want to give them broadband everywhere or high-speed internet, if you give them access to transport then many of the problems that they have go away.

Yes, you have less people moving into the city. I think autonomous mobilty is the revolution that can make public transport so much more attractive compared to the use of your personal car and Uber and services like that.

The reason I wouldn't use a personal car is if I could get a flexible time so I don't have to wait but if I get a taxi it's expensive so I want to have it as flexible as a taxi but as cheap as public transport.

Exactly. I think with autonomous mobility you can get pretty close to that.

So your goals for the moment for BestMile are developing the technology to work more efficiently?

So more efficient in a sense that we want to improve our technology to work at a bigger scale because it's not the same optimising a feed of tens of vehicles. When you are starting to optimise fleets of hundreds and thousands of vehicles you need your platform to be really robust and you need your algorithm to run really fast because that's actually the thing with algorithms: there is actually pretty good algorithms to find really good solutions. The problem is that it takes six hours for them to find a solution but you need real-time optimisation. If it's six hours, if it takes you six hours to find the solution it's already too late so it's more making the algorithm faster at a large scale so you can optimise for ten thousand of vehicles in the same time you would do it for hundreds.

So this fleet here is small and that's why it works quickly?

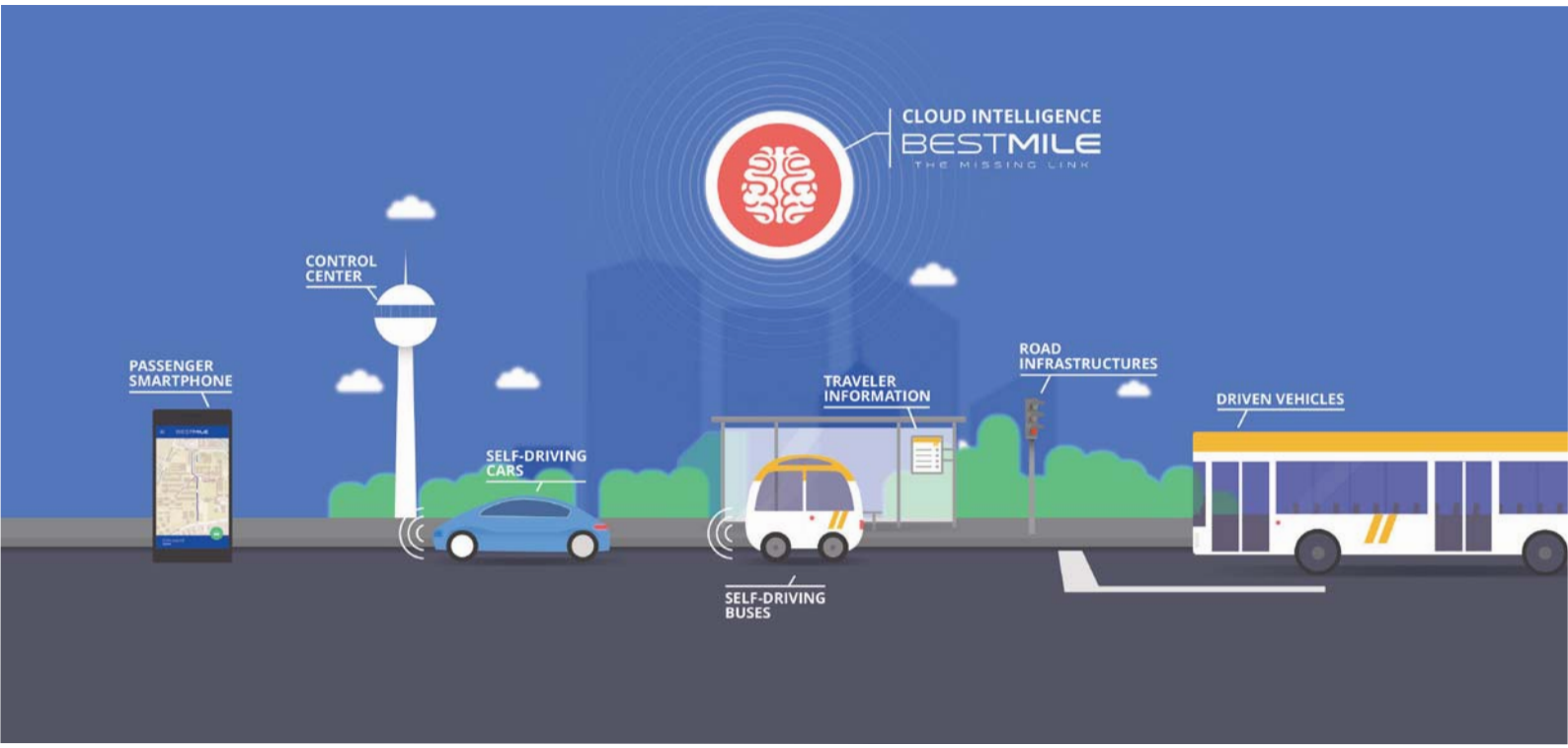
This one is, it only 2 vehicles at the moment. This project was launched on 23 June so we are still in the introduction phase. The shuttle runs every day from 1–7 approximately but they don't have a pre-defined schedule, they just run in a loop and that's it.

OK so, but people can log on and...

Yes, they can log on the app and know the next departure. But it's the next departure depending on the position of the shuttle now. There is not a fixed schedule that shuttle needs to respect for now.

Well I don't think it's necessary, if I as a passenger or wanting to be a passenger know where it is, I don't need to know the schedule, I just need to know how often roughly it comes, like how long it takes to do the loop.

Quite. Next maybe, they want to link it to the train station. So that's the next step and then they are thinking about implementing the



on-demand services but you will only be able to call a shuttle at pre-defined stops, you will not be able to order a shuttle from your home because there is only 2 shuttle, if everyone calls the shuttle at their place then nobody would have a shuttle.
For this project there is no driver actually there is no steering wheel in the shuttle but there is in order to, because Switzerland signed the Vienna Convention and in the Vienna Convention there is something that says you need to have a driver in the car, so this is why it is a little bit difficult legally, difficult. Things have to be changed legally to authorise autonomous vehicles on open road in countries that signed the Vienna Convention. To overcome this, there is a groom in every shuttle. The groom is there to welcome the passenger but he also has an emergency stop and he can stop the shuttle if he feels that the situation is unsafe. It never really happens but he has to be there otherwise we wouldn't have got the authorisation to run this project. It's pretty impressive that they managed to have authorisation and if the price to pay to have a groom dressed in yellow and welcoming passengers is actually pretty good because a lot of people are intrigued, they have a lot of questions so it works out well.

Yes, it's good for publicity in that sense and it makes people trust it a little bit more if he could press the stop button.

Yes and know that they're safe. The way we work today is that we have strategic partnership with shuttle manufacturers because a platform without shuttle, it's nice, but it's not really useful! And a shuttle without a platform, when you want to actually use a shuttle to transport people in an efficient way, you need the platform, so we have partnership with different autonomous shuttle manufacturers. So we have the one, Navia, who provided the shuttle for this project. They have actually a couple of projects launched. They have one shuttle in Australia, they just launched a project with two shuttles in Lyon in France. They are launching a lot of projects. Another company is American but also has a German-based site and it's actually the German team that developed the autonomous shuttle. The company is called Local Motors and they just launched their autonomous shuttle called 'Olli' back in June so they are also launching a good number of projects in October. You will see more and more autonomous shuttle and it will go pretty quickly that you will see autonomous mobility all over the place.

So the autonomous shuttles that these companies have that BestMile is partnering with now are getting smarter?

Exactly, yes, it's already a pretty intelligent shuttle! They manage to drive and not drive over anything! It's already pretty good, some human drivers can not do that! So it's pretty good but yes, it's also because in the first project people were already happy with an autonomous shuttle that could do a loop, but now people are starting to say, OK I've seen an autonomous shuttle, I know that it works and now I want to see what it can do for me, what it can bring and this is where yes we are needed to bring the next era of intelligence, of optimisation intelligence, at the level of the fleets, so yes, it's making the fleets more intelligent.

Who do you get this funding from? Is this European level?

OK so for the first one it was mostly European. We had a Business Angel and a couple of VC firms. We had a firm from the United States and then another one from Europe but most of the rest were business angels. It was 2.5million seed round. Now we are thinking of closing the second round maybe in Spring 2017 so it's really close but because we have a lot of requests.

It's a good problem to have, too many candidates?

Our goal is really to remain independent because we want to do global optimisation so we don't want to be affiliated to a certain brand for example. It makes no sense to have a platform that works with just one vehicle. We really want to stay global so we are really careful about who we bring in, in order to remain independent.

You want to do it properly.

Yes, it's really important.

Thank you so much for talking to me. This was really interesting.

Thank you.

Upcoming Railway Events

December, January, February 2016

01 December

Future of Rail

London, United Kingdom

Returning for its 15th year, Future of Rail offers a unique one-day briefing on the major issues facing the industry. Hear Network Rail's strategic priorities, keep up-to-date with major infrastructure projects, find out how the UK Government's strategies will affect operators and suppliers and discover the latest innovations that have potential to disrupt the rail market. **More info: www.marketforce.eu.com/events/transport-logistics/future-of-rail**

01–02 December

SmartRail Asia 2016

Bangkok, Thailand

SmartRail Asia returns to Bangkok, bringing together the region's leading rail and metro operators, decision makers and infrastructure managers. Learn more about the latest projects, technology and solutions alongside the 80+ rail and metro operators in attendance. This year, SmartRail Asia is proud to be supported by the State Rail of Thailand, and to be hosting the event in their fantastic Makkasan Airport Rail Link Expo Hall.
More info: www.smartrailasia.com

07–08 December

Rolling Stock Fleet Maintenance Cost Reduction Congress 2016

London, United Kingdom

The Rolling Stock Maintenance Cost Reduction Congress 2016 focuses on improving fleet reliability, availability, maintainability and safety at reduced cost through leveraging data analytics and condition-based maintenance. Following on from the success of last year's show, and featuring speakers from countries including the UK, Japan, Italy, France, the Netherlands, Portugal, Sweden and Finland, the summit returns for the 5th time.
More info: www.rolling-stock-maintenance.com

16–17 January 2017

Future Rail India

New Delhi, India

The Future Rail India summit brings together technology providers, policy makers, and decision makers from the Ministry of Railways and private and public sector stakeholders, who will discuss, provide insight and identify technology and best practices for smooth operations. The summit will focus on various aspects of upgrading and modernising projects related to planning, financing, construction, technology, operations and management.
More info: www.futurerailindia.com

24–25 January
Transport Ticketing

London, United Kingdom

Transport Ticketing Global 2017 is the annual get together for the entire public transport community involved in transport ticketing, passenger information and smart cities. With over 70 exhibitors showcasing cutting-edge technology in intelligent travel, the exhibition hall is the one place where you can learn about the solutions and technology available.

More info: www.transport-ticketing.com

24–25 January
3rd Global Track Maintenance & Asset Management Congress 2017

Berlin, Germany

The 3rd Global Track Maintenance and Asset Management Congress 2017 is the only global event dedicated to cutting-edge predictive track maintenance & driving operational efficiencies. Featuring industry-leading experts from SNCF, Transport for London, SBB CFF FFS, Network Rail, CrossRail, Bandedanmark, Ministry of Transportation & Communications, Rete Ferroviaria Italiana and more, this is the only event that unlocks the practical and strategic learning to help you get to the heart of how to reduce maintenance costs and improve track availability.

More info: www.rail-track-maintenance.com

21–22 February
Light Rail 2017

Gold Coast, Australia

The Australasian Railway Association and Informa are proud to present the 4th annual Light Rail Conference and Exhibition at the hub of light rail activity, the Gold Coast. The rapidly growing conference and exhibition offers a unique opportunity for professionals involved in manufacturing, the planning and delivery of projects and operational executives, to hear cutting-edge case studies and learn from successful projects in Australasia and throughout the world.

More info: www.informa.com.au/conferences/transport-conference/infrastructure-conference/light-rail

Extend bearing maintenance intervals to 1,7 million km*

with the SKF Passenger Bearing Unit 1,7 M km

Imagine the savings if the service life of your axlebox bearing units matched that of your wheelset maintenance schedule.

This can now happen. With improved contact geometry and patented SKF Xbite® heat treatment, the new generation axlebox bearing units from SKF are designed to go 1,7 million km between maintenance. This enables the alignment of bearing maintenance intervals with the longest wheelset maintenance intervals for reduced cost and more uptime.

In addition, SKF calculations indicate a 40% increase in L_{10} bearing life compared to previous generations, helping to further improve operational reliability.

For more information about this new bearing unit for 160–250 km/h EMU/DMU/passenger coach applications, visit railways.skf.com.

Shown, optional sensorized version for speed/temperature/vibration

* 1,7 M km is based on specific applications and operating conditions. It has been verified in a number of positive tests of individual features as well as with experience from the field. Please contact your SKF representative to discuss if and how this can be applied in your applications.

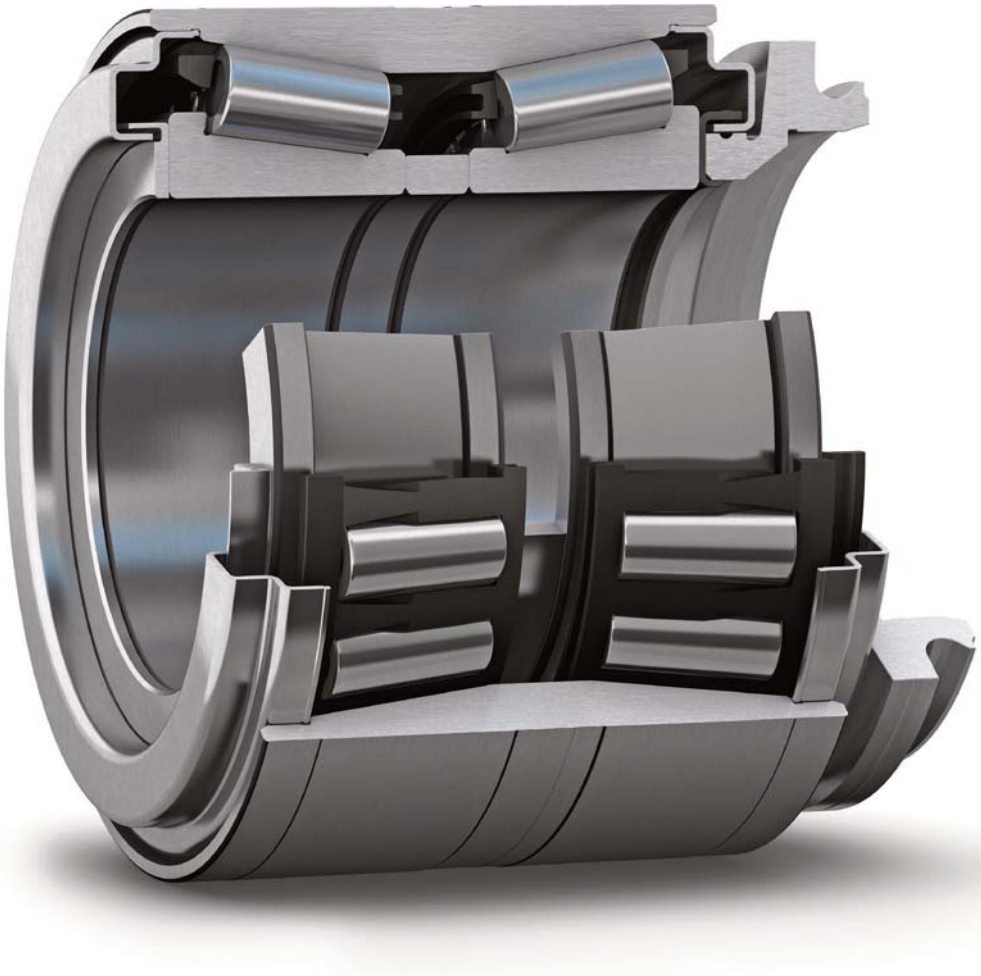
Setting the wheels in motion for reducing overhauls

SKF

Innovations in design, lubrication and heat treatment have created the first railway wheel set bearings that doesn't require overhaul between wheel replacements.

Minimizing the number of overhauls for a bogie during the life of a train is key to reducing life cycle cost. Extending the service interval from four to six years can bring savings of about 3 000 EUR per bogie per year.

Looking back more than a decade the wheels were one of the main limiting factors to extend the time between maintenance intervals. Nowadays the use of computer controlled under-floor lathes to remove flat spots and compensate for wear means that a set of wheels can last for more than 1.5 million km before replacement is required.



Until now the bearings upon which those wheels rotate have not been able to meet the longer wheel life. The service life of most components in the bearing, e.g., rings, rollers and seals can even with conservative life calculations outlast a set of wheels by a factor

of two, but only if there is enough lubrication. This leads to the critical point. Grease life of railway wheel bearings has long been a weak link in extending bogie maintenance intervals.

Grease is a vital component in railway wheel bearings – it separates the metal surfaces inside the bearing to prevent wear and protects those surfaces against corrosion. The properties of grease change over time, however the base oil component within the grease – which provides lubrication and protection – gradually bleeds out of the thickener that holds it in place. Eventually, the grease is exhausted and must be replaced. Standard rail bearing units typically require overhaul and re-lubrication every million km, a process that requires the vehicle to be taken out of service and the bearings removed. As the wheel life is getting longer the bearing becomes the limiting component. For operators, these periodic bearing overhauls are a costly and inconvenient maintenance requirement that they would avoid if they could. In an ideal world, bearing overhaul intervals would match the life of the wheel set, so that both jobs could be completed in a single operation.

That situation has become a reality, thanks to an intensive R&D project by engineers at SKF. The company's latest railway wheel bearing has been designed to operate for 1.7 million km between overhauls, allowing bearing overhaul schedules to match replacement of even the most durable wheels. The SKF team achieved this reduction in maintenance requirements, by focussing on the factors that affect the life of the lubricant within the bearing.

That process began with the lubricant itself. "To maximise the performance and service life of grease, you have to balance the rate at which the base oil bleeds from the thickener," explains Jan Babka, Senior Application Engineer in SKF's rail division. "If the grease bleeds too fast, it will quickly become exhausted, but if it bleeds too slowly, it will not release sufficient oil to separate the metal surfaces." To find a grease with the best possible combination of characteristics for the wheel bearing application, SKF worked closely with leading rail industry lubricant suppliers. Having achieved a good starting point, the team then addressed the other characteristics that affect grease life. "Grease life is influenced by a large number of factors, including temperature, rotational speed, bearing size, cleanliness, mechanical churning and other things like the presence of electric currents," explains Babka. In a railway wheel bearing, most of those characteristics are determined already by the application, but three where we could have a lot of influence are smoother surfaces, cooler running and higher robustness"

Smoother

Even if a rolling surface in a bearing feels smooth when you touch it – it is still not perfectly flat. The surface roughness plays

an important role in how much wear and friction is generated. It is important to limit wear since any lose metallic particles can accelerate oxidisation of the grease and shorten grease life. It is also important to reduce friction due to surface roughness since it heats up the grease which in turns reduces grease life. For this reason SKF has refined the surface finishing process of our wheel bearings.

Cooler

Controlling the temperature of the grease required SKF to draw upon its extensive experience of rolling bearing design. "Temperature is one of the most influencing factors when it comes to grease life" explains Babka. "And the main cause of a rise in temperature is friction within the bearing." The challenge for the SKF engineers, therefore, was to find a way of reducing friction without negatively affecting the strength or operating life of the bearing itself.

Their solution was subtle changes to bearing geometry to optimise the length of the contact between roller and raceway. A long contact gives a high carrying capacity of the bearing but you have to pay for that by increased friction and shorter grease life. The key is to find the right geometry for the right bearing and its operating conditions. On a typical 130x240 size TBU, SKF's testing revealed a 30 % reduction in rolling friction, resulting in a drop in temperature of 10°C under normal operating conditions.

Higher robustness

To ensure that the bearing would not fail even when approaching the service life of the grease when wear can become a problem SKF make use of its patented Xbite heat treatment technology for the bearing rings. Xbite delivers an extra tough "bainite" steel with the same hardness as conventional "martensite" but with higher toughness and longer fatigue life. It also has a higher resistance to wear and a slower crack propagation.

The new SKF TBU is now in production in a range of common sizes. The unit, which is suitable for trains operating between 160 and 250km/h, is already in service with one major European rail operator. So is this the last stop for technology development in railway wheel bearings? Babka doesn't think so. "1.7 million km is what this industry is asking for today, but there is no doubt that it will always be looking for ways to extend component life and reduce maintenance requirements. In other rail applications, like traction motors, we already make use of other methods to provide even longer grease life, for example through the use of hybrid ceramic bearings. That technology it is too expensive today for large bearings, but it shows that in the long term, it should be quite possible to create a bearing that will run for 3 million km between overhauls."

SKF®

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