

Edition 22 | December 2008

# INFORMER

The customer magazine of Knorr-Bremse  
Rail Vehicle Systems

## Sites

Knorr-Bremse in China

## Project

Development partnership with  
Alstom and Bombardier

## Product

Windscreen wiper and  
washer systems  
Sanding systems

## Aftermarket

Obsolescence management

**KNORR-BREMSE**



## Contents

## Editorial

Dr. Wolfgang Schlosser 3

## Sites

Asia here we come – Knorr-Bremse in China 4

## Product

Windscreen wiper and washer systems 8

Sanding systems 14

## Project

Development partnership with Alstom 12

Development partnership with Bombardier 18

## Aftermarket

Obsolescence management 22



### Imprint:

Publisher:  
Knorr-Bremse Systeme für  
Schienenfahrzeuge GmbH  
December 2008

Information for Knorr-Bremse's worldwide customers and business partners

Central Editorial Office:  
Knorr-Bremse Systeme für  
Schienenfahrzeuge GmbH  
Marketing  
Karin Dirscherl  
Moosacher Straße 80  
80809 München  
Deutschland  
Tel. +49 89 3547-1731  
Fax: +49 89 3547-2767  
Karin.Dirscherl@knorr-bremse.com  
www.knorr-bremse.com

Conception, text and design by:  
Knorr-Bremse Systeme  
für Schienenfahrzeuge GmbH

KB MEDIA GmbH  
Editorial: Carmen Häberlein

Text, layout, graphics: dvhaus GmbH

Printed by: Pera Druck GmbH

## Editorial

2008 was a highly successful year for Knorr-Bremse, with the rail vehicle division recording further growth despite the global financial crisis. Such a positive result was only possible because we are able to offer customers high-quality products and services at local level: our growth is based on a **world-wide presence, outstanding systems competence, innovative capability and excellent service.**

**World-wide presence:** As a global player we were able to help China prepare for hosting the Summer Olympic Games by developing an outstanding passenger transportation infrastructure. Knorr-Bremse systems were supplied for the extended metro lines in both Beijing and Shanghai. But our contribution to the smooth running of the Games was not confined to local mass transit systems – mainline inter-urban links were also included. Moreover all the systems were delivered on schedule and were “Made in China” – five joint ventures and our own plant in Suzhou enabled us to fully meet Chinese government requirements for local content.

**Outstanding systems competence:** This edition of the Informer illustrates Knorr-Bremse's ability to offer compact, light-weight, economical solutions with the example of the TRAXX locomotive – a customizable platform focused on reliability, safety and efficiency. For years, manufacturers such as Bombardier and other systems suppliers have been successfully using Knorr-Bremse products in the international rail vehicle sector.

**Innovative capability:** Knorr-Bremse is continuously developing more and more efficient and environmentally-friendly solutions. At our plant in Mödling, Austria, for example, we design and manufacture customized windscreen wiper and washer systems for all vehicle types, as well as sanding systems that offer optimum traction between wheels and rails with minimal fine dust pollution.

**Excellent service:** Knorr-Bremse customers can rely on immediate 24/7 availability of original parts, even decades after a product was first manufactured, thanks to our excellent logistics systems and measures like the obsolescence management system within the REX RailEXcellence process model.

Over the past year, Knorr-Bremse has once again demonstrated its ability to respond to both present and future challenges. All our processes, methods and resources are based on tried-and-tested technologies and designed to produce optimum solutions.

I would like to thank you for the confidence you have shown in us during 2008 and wish you a happy and prosperous New Year.

Dr. Wolfgang Schlosser



Dr. Wolfgang Schlosser  
Member of the Board  
of Management  
Knorr-Bremse Systeme für  
Schienenfahrzeuge GmbH



Asia here we come – Knorr-Bremse in China

# Continued growth

Even with the 2008 Summer Olympics over, the signs are that the rail sector in China is going to expand further. And Knorr-Bremse is well placed to respond to the requirements of the Chinese market.

China is experiencing massive migration to the country's cities – and this is boosting demand for rail services in and between urban centers. But the transport infrastructure still has a long way to go if it is to keep pace with current developments. In 2006 the country had no fewer than 125 cities with over a million inhabitants, but most of them lacked any metro network. They are currently drawing up substantial investment programs.

**Strong presence  
– Knorr-Bremse  
expands its  
activities in China**

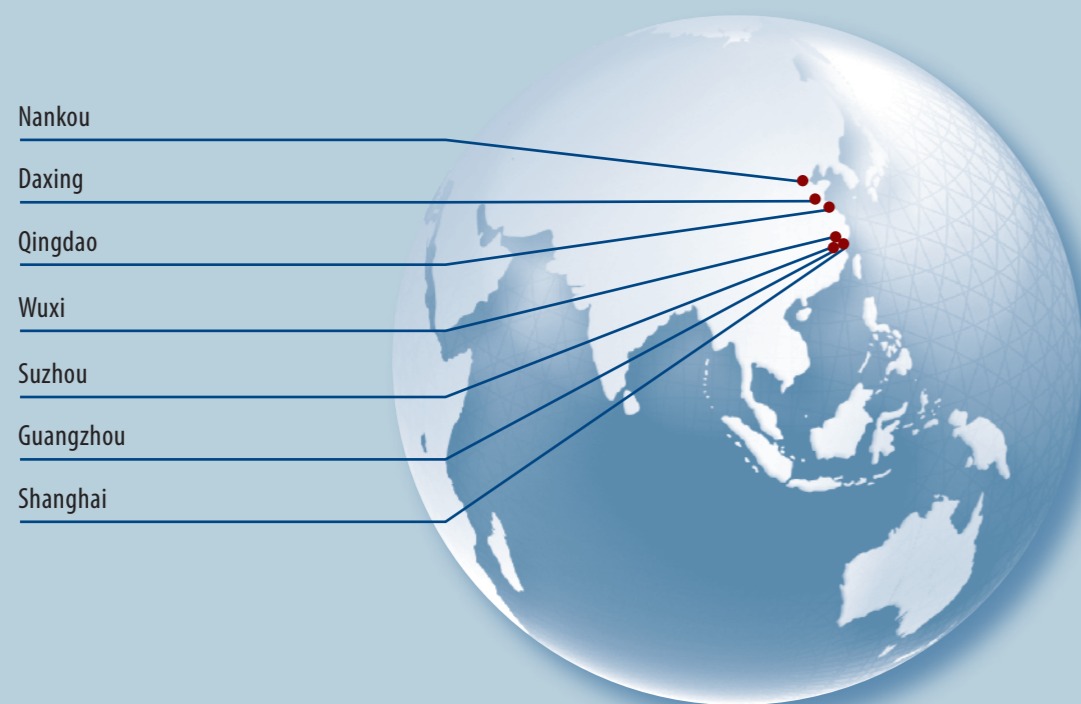
## Our strength in China – customer proximity

One good example is Guangzhou. This industrial metropolis in the south of China with a catchment area of some 10 million people is determined to increase the capacity of its rail network tenfold by the year 2015. At least 21 cities are currently expanding their networks, and a further 11 have started drawing up detailed plans.

Knorr-Bremse is in a strong position to play a lead role in this development. The company currently markets its full range of products in China, including braking, door and air-conditioning systems, as well as electrical components. A combination of four joint ventures and its own two plants in Suzhou and Shanghai (Merak) has enabled Knorr-Bremse to meet the Chinese government's requirements for local content.

- In 2006 the first joint venture, Westinghouse Platform Screen Doors (Guangzhou) Ltd., was set up to manufacture platform screen doors.
- The same year, IFE-VICTALL Railway Vehicle Door Systems started up production of modern door systems in Qingdao.
- Daxing is the location for Knorr-Bremse CARS LD Vehicle Brake Disc Manufacturing (Beijing) Co. Ltd., which is now the market leader for high-performance brake discs for Chinese mainline trains.
- Air compressors and driers for high-speed trains and high-performance locomotives are manufactured in Nankou by Knorr-Bremse Nankou Air Supply Unit (Beijing) Co. Ltd.

At the end of 2007 an agreement was signed setting up a further Chinese joint venture – Merak-Jinxin – which supplies high-quality air-conditioning systems for Chinese rail vehicles.



### Merak-Jinxin

This latest in the series of successful joint ventures is located in Wuxi, a city of four and a half million inhabitants on Tai Hu, the third largest lake in China. It was here that representatives of Merak and the Chinese Wuxi Jinxin Group signed the agreement setting up Merak-Jinxin Air Conditioning Systems (Wuxi) Co. Ltd. on November 9, 2007.

For air-conditioning manufacturer Merak the joint venture represents a further step towards expanding its activities in China. Industry experts forecast huge growth in demand for rail vehicle air-conditioning systems over the next few years.

The two partner companies Merak and Wuxi Jinxin are well positioned to serve this market. More than 35,000 Merak air-conditioning systems are currently in operation in all types of rail vehicle world wide. Wuxi Jinxin has an excellent domestic reputation as a specialist for accessories and interior fittings for rail vehicles and is a certified supplier to the Chinese Railway Ministry. The signs are that Merak-Jinxin will be able to benefit hugely from the growing domestic market for rail vehicle air-conditioning, with annual sales in this sector forecast to reach 80 million by 2012.

### Merak air-conditioning

HVAC equipment from Merak can be found in rail vehicles all over the world, functioning efficiently even in the harshest climatic conditions and providing comfort for passengers in the high-speed segment as well as in metros in major cities like Vancouver, São Paulo, Madrid, Singapore and Shanghai. This rapidly growing manufacturer based in the Spanish city of Getafe near Madrid has been part of the Knorr-Bremse Group since 2006.

### Beijing 2008: Gold for Knorr-Bremse

Before and during this year's Olympic Games in Beijing Knorr-Bremse amply demonstrated its ability to respond efficiently to unusual challenges. The statistics for the Games were impressive: seven million visitors over a period of three weeks posed enormous challenges for passenger transportation. Understandably enough the organizers were anxious not to run any risks with the rail transportation system – which was why they turned to Knorr-Bremse.

In the summer of 2001, when Beijing was awarded the 2008 Summer Olympics, Knorr-Bremse had already established a name for itself in the Chinese capital as a supplier of systems for the metro. Knorr-Bremse Far East Ltd. – now Knorr-Bremse Asia Pacific – had been supplying the Beijing City Rail line since 2000, and it was not long before the Ba-tong Line was added to its list of customers. The company proved a reliable partner during the rapid expansion of the mass transit system, with the EP 2002 intelligent brake valve proving a particular hit.

In the run-up to the Olympics Beijing Metro further expanded its capacity: the newly-built Lines 5 and 10 were supplied with 39 and 40 six-section trains respectively, the new Cityrail Airport Line received ten trains, each with four cars, and 36 new trains with six cars each were purchased for the existing Line 2. A further 33 trains are currently due for delivery to Line 4, which is still under construction. All these vehicles are equipped with Knorr-Bremse systems.

### Strong position even after the Games

The fact that demand has continued to rise even after the Games is demonstrated by the latest orders for 2008. Knorr-Bremse is to equip a further 1,780 Chinese locomotives with braking systems as well as supplying systems for 40 16-car high-speed trains and for about 1,500 metro cars for various Chinese cities. And over the next few months a further boost for the booming rail vehicle market is likely to come from a rail infrastructure investment program worth some 200 billion euros currently being planned in detail by the Chinese government.



### Strengthening aftermarket resources

The Chinese and Germans jointly developed an across-the-board concept to ensure the availability of rapid aftermarket support, bringing in specially trained experts from Germany, the UK, the USA and Japan. During the Games themselves, 25 Knorr-Bremse staff members were seconded to Beijing, including specialists for technical service and commissioning of the systems. The service experts maintained a constant presence in the depots so as to ensure that any technical problems could be rapidly solved; and a reliable supply of original parts was available round the clock.

Mainline services were also provided with back-up by specialists from Knorr-Bremse and its subsidiaries Merak and IFE. In

addition to the Siemens Velaro (CRH 3) high-speed trains operating on the Beijing to Tianjin line, CRH 5 trains on the lines to Changchun, Shenyang and Harbin were also supported. The staff involved included engineers from Knorr-Bremse's Suzhou site, 14 IFE service engineers, three of them from Waidhofen, Austria, and a total of 24 Merak engineers and service specialists, 11 of them from abroad. This extra support ensured that a high proportion of trains remained in operation throughout the duration of the Games.

As Beijing Metro confirmed in its letter of thanks to Knorr-Bremse, the company's commitment made an important contribution towards ensuring that the standard of the transport infrastructure matched the excellence of this superlative sporting event.

## Windscreen wiper and washer systems

# Clear view ahead

For decades, windscreen wiper and washer systems from Knorr-Bremse have kept rail vehicles running in all conditions. To make sure this continues, our Mödling plant is developing new, value-for-money solutions for a full range of vehicle types and applications.



In Mödling, Knorr-Bremse has created ideal conditions for developing new windscreen wiper and washer systems. The engineers at the Austrian plant have state-of-the-art technology at their disposal, including equipment for shock and vibration testing, simulation of extreme climatic conditions, analysis of electro-magnetic compatibility and performance testing under continuous operation. By concentrating development, design, production and quality assurance at a single site, co-ordination and development processes can be speeded up and customers' wishes rapidly met. The result is an extensive portfolio of high-quality windscreen wiper and washer systems for a broad range of vehicle types and requirements.

**Standardized,  
proven  
components for  
reliability and  
economy**

For many years, manufacturers were content to adapt windscreen wiper/washer systems developed in the automotive industry for use on rail vehicles. But that is no longer enough. The increasingly specific needs of customers have long since led to the development of tailor-made solutions for the particular operating conditions and applications in the rail sector.

In individual cases this can still mean that a tried-and-tested automotive adaption is used, for example for older vehicles. Knorr-Bremse continues to have pneumatic windscreen wipers in its portfolio, even though electrically-driven systems have long since become the norm. This enables the company to honor supply agreements that often date back several decades.

The latest systems from Mödling offer considerable improvements compared with older models. The development engineers have focused in particular on reliability and economy of operation across a product's entire lifecycle. To achieve this, they have combined vehicle-specific design with a high degree of standardization and have incorporated tried-and-tested components into innovative systems.



*High End System drive unit + wiper arm and blade (EHS) + stop*

## Broad range of services



### PBS

Knorr-Bremse guarantees to supply systems and original parts for longer than is customary in this industry – that is why the company's portfolio still includes pneumatic windscreen wipers. These require no electrical power connection and are easy to use, even if they offer fewer functions than more modern systems.



### EAS

Highly reliable and durable Electrical Advanced Systems were especially developed by Knorr-Bremse for rail vehicles rather than being based on adapted automotive applications. Stringent testing ensures that all components and units conform to the latest technological standards. Systems are tested for electro-magnetic compatibility as well as resilience to shock, vibration and extreme climatic conditions.

EAS systems are similar to the Electrical Basic Systems in terms of the technical functioning of the wipers, but offer the following additional advantages:

- Integrated water supply in drive unit means no extra penetration of vehicle skin required
- Spare parts supply guaranteed for more than 30 years
- High levels of reliability
- Life span at least 10 million double sweeps



### EBS

Electrical Basic Systems comprise components and units that have been taken over from the automotive industry and modified for use on rail vehicles. In order to reduce installation requirements they are supplied as complete pre-assembled systems. The wipers function with links and pivots, and purchasing costs are kept to a minimum.

Compared with pneumatic wipers, EBS systems offer the following additional features:

- Two wipe speeds
- Constant or adjustable intermittent wipe function
- Drying function, with two or three sweeps following washer operation

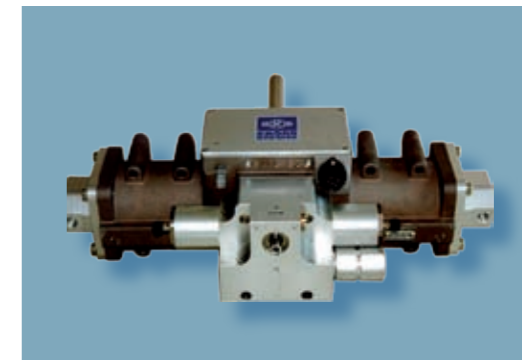


### EHS

Electrical High End Systems are state-of-the-art in all respects. The drive system, rotary angle sensor and other components come from the IFE door drive system range and have been tried and tested under the harshest of operating conditions.

The movement of the wiper is regulated by a rotary angle sensor and separate control unit, which means that the EHS system offers a large number of new features compared with the EAS series including:

- Extra park positions in addition to standard one (incl. well clear of wiping area, central position, washing plant position etc.)
- Special wiper functions possible without modification of mechanical components
- Spraying of front windshield prior to wiping to reduce wear on windshield and wiper blade
- Adaptive drive motor torque control
- Synchronization of two wiper drives without mechanical link
- Flexible adaption of wipe angle and speed as well as functions such as wiper speed, intermittent wipe and drying
- Software-driven adaption to customer requirements possible during course of project
- Life span at least 12 million double sweeps



### PHS

Electro-pneumatic hybrid systems were developed specially for high-speed train windscreens with spheroidal curvature. An electronic control unit receives and processes input signals from the operating unit and wiper drive system. The functions are then realized with the help of an electro-pneumatic unit.

Electro-pneumatic hybrid systems offer the following advantages in addition to EHS systems:

- 200 Nm breakaway torque
- Pneumatic emergency operation
- Aerodynamically-designed wiper arm with park position out of sight
- Generous wiping area through use of double wiper blades

### Customer-specific modifications

Customers are not only able to choose the right wiper and washer system for their needs from the wide range available – systems can also be individually adapted to specific installation requirements. This means that every solution precisely meets customers' wishes. And the ongoing R&D activities at Mödling mean this will be the case in the future, too.

Development partnership with **ALSTOM**

## Joint route to success

Under the LP150 program, Alstom and Knorr-Bremse have set up a partnership to develop a second generation of transnational braking systems for the Prima platform.

### Prima: reliable and easily maintained

Even the prototype of the Prima locomotive – presented back in 1999 – aroused considerable interest with its straightforward manufacture and standardized equipment based on tried-and-tested components. Customers particularly like its high levels of reliability, ease of maintenance and capability of further development. More than 1,750 of these robust locomotives have already been sold, with France as the main purchaser and interest also coming from Syria, Israel and Sri Lanka. Customers now also include the Chinese Railway Ministry.

### Prima II: even greater safety, economy and comfort

In May 2008 the French manufacturer presented a completely re-engineered Prima II platform at its center of competence in Belfort. This new generation boasts an even greater degree of modularity, enabling Alstom to fulfill increasingly specific customer requirements while at the same time reducing delivery times.

The locomotives can now be configured to achieve speeds of up to 200 km/h. The exterior design meets the most stringent requirements in terms of safety and ease of maintenance. Generously proportioned windows in the driver's cab ensure an unimpeded view, and excellent air-conditioning, additional sound insulation and many further innovations make for enhanced comfort. The extremely easy-to-use controls conform to the requirements of the EU European Driver's Desk project. And the drive electronics with IGBT converters are state-of-the-art.

## Knorr-Bremse and Alstom – a perfect partnership

Prima II is compatible with four different voltages, making it eminently suitable for transnational operations within Europe. The platform can also be adapted to a broad range of different rail systems world-wide.



## Sanding systems

# Optimum friction, minimum dust

When tracks are dirty, wet, icy or covered with leaves, a small amount of sand between the wheel and rail can help solve friction problems during start-off and braking. The latest, improved sanding systems from Knorr-Bremse can be modified to cater for a wide range of conditions.

In recent years the demands made on sanding systems have increased significantly. To minimize costs and environmental impact it is important that they should distribute only the precise amount of sand that is necessary to improve traction. And efficient, environmentally sensitive driving is only possible if the driver knows he can rely on the system functioning reliably in all situations. In many parts of the world, sanding systems also have to be designed to cope with extreme weather conditions. The very fact that manufacturers make such demands nowadays is partly due to Knorr-Bremse's success in building on more than 100 years of experience to develop its sanding technology. The company now offers high-grade sanding systems that represent excellent value for money – as demonstrated by our many highly satisfied customers.

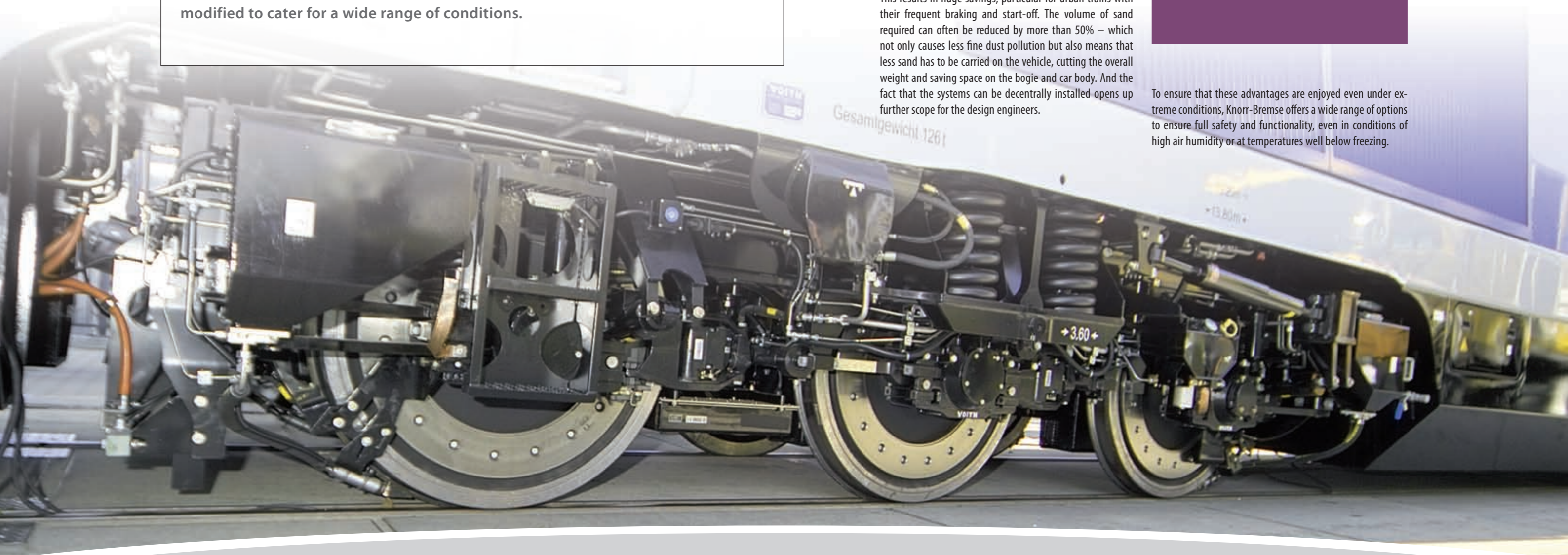
### Sanding geared to speed and situation

The days when the sand was applied manually by the driver using a tipping mechanism are long since over. In those days it was largely a matter of luck how much sand ended up between the wheels and the rails. Nowadays, sanding is carried out automatically using a sophisticated traction and brake management system that monitors the speed and driving situation and delivers only the precise volume of sand required.

This results in huge savings, particular for urban trains with their frequent braking and start-off. The volume of sand required can often be reduced by more than 50% – which not only causes less fine dust pollution but also means that less sand has to be carried on the vehicle, cutting the overall weight and saving space on the bogie and car body. And the fact that the systems can be decentrally installed opens up further scope for the design engineers.

**Sand  
requirement  
often reduced  
by over 50 %**

To ensure that these advantages are enjoyed even under extreme conditions, Knorr-Bremse offers a wide range of options to ensure full safety and functionality, even in conditions of high air humidity or at temperatures well below freezing.





## Five basic types, countless variations

Knorr-Bremse sanding systems can be divided into five basic types, though each can be adapted to the particular needs of the customer:

### For streetcars without central compressed air supply:

- **Type SEJ sanding system with compressor:** optional sand drying in lower part of sandbox.
- **Type SDN14 sanding system with compressor:** Drying of entire sand supply, heated sand pipe, vane compressor with choice of DC motor or maintenance-free electronically commutated synchronous motor.
- **Type SDN31 sanding system with compressor:** As for SDN15, but with medium pressure compressor instead of vane compressor, and option of air-jet system for pipe cleaning and sand delivery.

### For vehicles with central compressed air supply:

- **Type SD sanding system:** Without drying, air-jet or heating functions, not speed-related.
- **Type SDN31 sanding system:** As for streetcar system of same name, but with air supply from main reservoir pipe.

## Modules for all operating conditions

Temperatures below -40 degrees centigrade are admittedly not found in every part of the world, but any operator using sanding systems in such extreme conditions has to be sure they can cope with freezing temperatures. Systems from Knorr-Bremse can have various modules added to meet special requirements:

- Heating of sanding pipe end to prevent freezing in low temperatures
- Drying of sanding pipe to ensure free flow of sand
- Loosening and drying of sand in sandbox to prevent formation of clumps
- Air-jet pipe cleaning and sand delivery on vehicles with particularly long sand pipes

Further options include an LED sand level indicator and a sand box designed for pistol-type filling.

## High-precision modular systems

Modular design is the key to the future. In the near future all Knorr-Bremse sanding systems will be available in modular form, enabling the customer to put together a complete solution that meets his precise operational requirements. And development work continues on achieving even more precise dosing and delivery of sand to the wheel and rail.

## Putting sanding systems to the test

An important priority for Knorr-Bremse is to ensure the full functionality of all sanding systems prior to delivery and to facilitate their assembly, installation and commissioning. With this in mind, exhaustive laboratory testing is carried out at the company's state-of-the-art facilities in Mödling, Austria. All sanding system types and applications are tested in a wide variety of different installation scenarios and the results subjected to rigorous operational testing and evaluation.

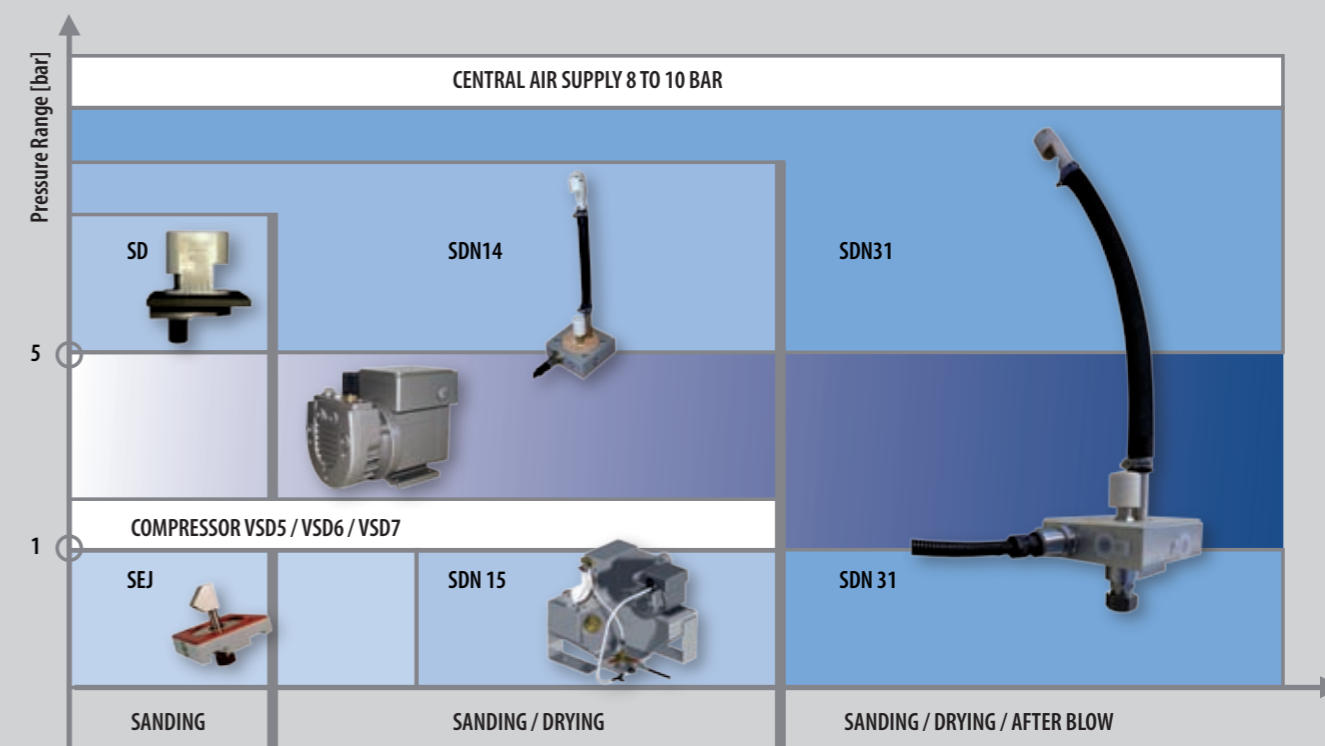
The following tests are included:

- **Sand delivery volume** – to adjust the system to the type of sand used by the operator
- **Shock and vibration testing** – to examine the ruggedness of the design, verifying mechanical calculations by means of a vibrating plate and shock vibrator.
- **Climate testing** – to examine the temperature-resistance of individual components in the test chambers of the Vienna climate wind tunnel.

## Overview of main advantages

- Optimized friction between wheel and rail when track is dirty, wet, icy or covered with leaves
- Minimized fine dust pollution thanks to reduction in required sand volume, often by over 50%
- CO<sub>2</sub> reduction through weight savings and more ecological driving style
- Considerably reduced space requirements
- Reliable operation even in extreme climatic conditions
- Largely maintenance-free
- Extensive diagnostic options

## Sanding systems



Development partnership with **BOMBARDIER**

# Working together for the best solution

The creation of customized braking systems for Bombardier Transportation's TRAXX platform is a further example of a successful development partnership between Knorr-Bremse and a global rail vehicle manufacturer.



## Development partnership with Bombardier Transportation

TRAXX, Bombardier Transportation's cross-border platform for medium-weight freight and passenger trains, has proved extremely popular, with no fewer than 1,230 locomotives currently on Europe's rail networks – more than 800 of these operated by the leading European rail companies. Over 80% of all TRAXX models are now equipped with the MBS modular brake control system – and in the case of the current TRAXX2 and TRAXX2e models the figure is 100 %. Which only goes to show how successful the products of Knorr-Bremse's development partnership with Bombardier have been.

TRAXX stands for Locomotives Platform for **T**ransnational **R**ailway **A**pplications with **eXtreme f**lexibility. The electric multi-system locomotives that are used for cross-border operations have to be capable of modification at low cost in order to meet the specific requirements of each national approval body. This is where Knorr-Bremse's MBS system – and also the modular design of its bogie and air supply equipment – makes an important contribution. And in the case of the new TRAXX2 and TRAXX2e locomotives, economy of operation has been further improved by standardization of a high proportion of parts across all classes.

TRAXX is thus a perfect example of successful development collaboration. The figures speak for themselves:

- Between 2000 and 2005, Knorr-Bremse supplied the locomotives of the TRAXX1 generation (BR185.1, BR146.1) with 370 systems.
- From 2004 onwards, a further 430 systems for the TRAXX2 generation of TRAXX-AC locomotives were supplied (BR185.2, BR146.2).
- In 2006, the TRAXX2e locomotives TRAXX-MS, TRAXX-DC and TRAXX-DE were supplied with a total of 385 systems.
- Since 2008 Knorr-Bremse has been supplying an average of more than one braking system per working day for the TRAXX2 and TRAXX2e platforms. In some months a total of 30 systems have been supplied.

## TRAXX1

In January 2000, when Bombardier first introduced the prototype of the TRAXX 185 001 locomotive, it aroused considerable interest from DB Cargo – now Railion – which was increasingly finding itself working on a transnational basis with locomotives that had to be capable of operating on two different systems. Within a short period of time the Class 185 became the leading electric locomotive on the German rail network. Various versions have been specially adapted for international links to Austria, France and Switzerland, and a Nordic package is also being planned for the Scandinavian countries. In addition to Deutsche Bahn, leasing companies such as MRCE and Angel Trains have also purchased the TRAXX system, which they have supplied to German, Austrian and Swiss private railway systems. On the German regional train network, the Class 146.1, which became available in 2003, is widely used.

## TRAXX2

The TRAXX2 was developed out of the TRAXX1 in order to comply with new, stricter crash testing regulations. The first F140 MS models were used from 2004 onwards by SBB Cargo for its cross-border operations to Italy. A further development, the F 140 AC2, is used by Railion under the class name 185.2.

Today, TRAXX2 locomotives can also found in the fleets of various different leasing companies that supply them to private rail operators throughout Europe. Since July 2005, the Class 146.2 has been available for regional rail operations, with customers including DB Regio, metronome, NOB and Württemberg Transportation.

## TRAXX 2E

Standardization of the current TRAXX 2E series has continued. The same locomotive body is now used for both electric and diesel-electric versions. Bogies and drive systems have been further improved and operating elements adapted to meet international standards.

The TRAXX 2E – available as a four-system locomotive (BR 186) for AC and DC systems with various country-specific packages – has already been ordered by several leasing companies. It is operated as a DC locomotive in Italy, with leasing company Angel Trains currently supplying 20 of the 28 locomotives. And a DC version also operates on the Spanish broad-gauge network under the name Renfe S/253. The diesel-electric locomotives for passenger transportation bear the name BR 246 and for freight transportation, 285.

Dr Jonathan Paddison



Dr. Jonathan Paddison has been Senior Vice President Sales & Systems at Knorr-Bremse Rail Vehicle Systems with responsibility for locomotives, passenger cars and freight cars since September 2007.

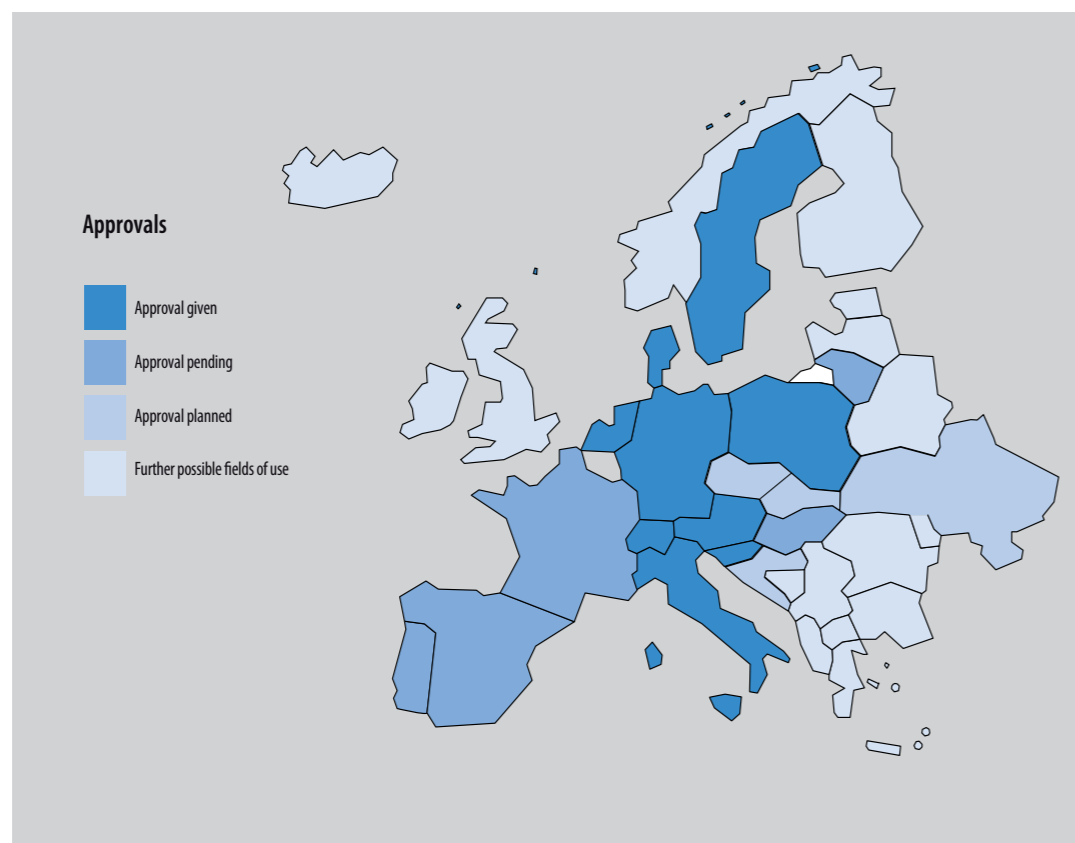
Born in England in 1968, he started his career with Knorr-Bremse as a systems engineer in 1997. From 1998 he was project leader and from 2000 head of development for modular braking systems, and between 2002 and 2007 he was Deputy Chairman and Deputy Director of Knorr-Bremse Rail Systems Japan. Dr Paddison is married with one daughter.

## MBS

In the USA, CCB II, the American equivalent of MBS, has long since moved to pole position amongst brake control systems, and now a similar development can be observed in Europe for MBS. The modular braking system can be used on a wide range of diesel and electric locomotives and control cars. It has already been licensed for use in Germany and eight other European countries, and approval for most of the other countries in Europe is either planned or already in the pipeline. Thus more and more countries are set to benefit from the advantages offered by MBS – or MBS Europe, as the modified version for TRAXX2e is called – for transnational operations:

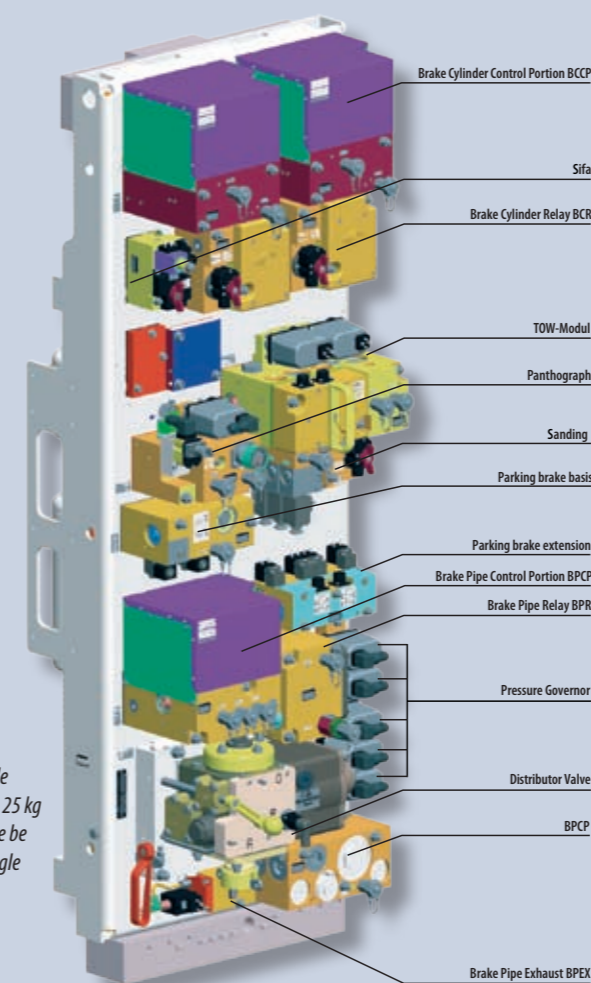
- User-friendly architecture thanks to incorporation of hundreds of components into compact modules
- Rapid fault identification using internal diagnostics
- High levels of vehicle availability thanks to rapid and simple replacement of faulty modules
- More than 50% reduction in cabling thanks to bus-based communications
- Highly economical thanks to large numbers of standardized components
- Precisely adaptable to specific operating conditions
- UIC-compatible components throughout, according to latest EU standards

Modules can be installed decentrally or on a central brake panel with easily accessed operational elements and test points.



In many European countries, approval of MBS has already been achieved or is in the pipeline.

## TEC-Special



Each MBS module weighs less than 25 kg and can therefore be replaced by a single person.

## Advantages

- Reduced maintenance and repair times
- Improved vehicle availability
- Low life-cycle costs
- Light-weight, compact modules
- Simple plug-&-play installation
- Simplified interfaces
- 50 % less internal cabling thanks to bus-based communication
- New functions added via software update
- Economical thanks to standardization
- Every fault immediately localizable and faulty module simply replaced

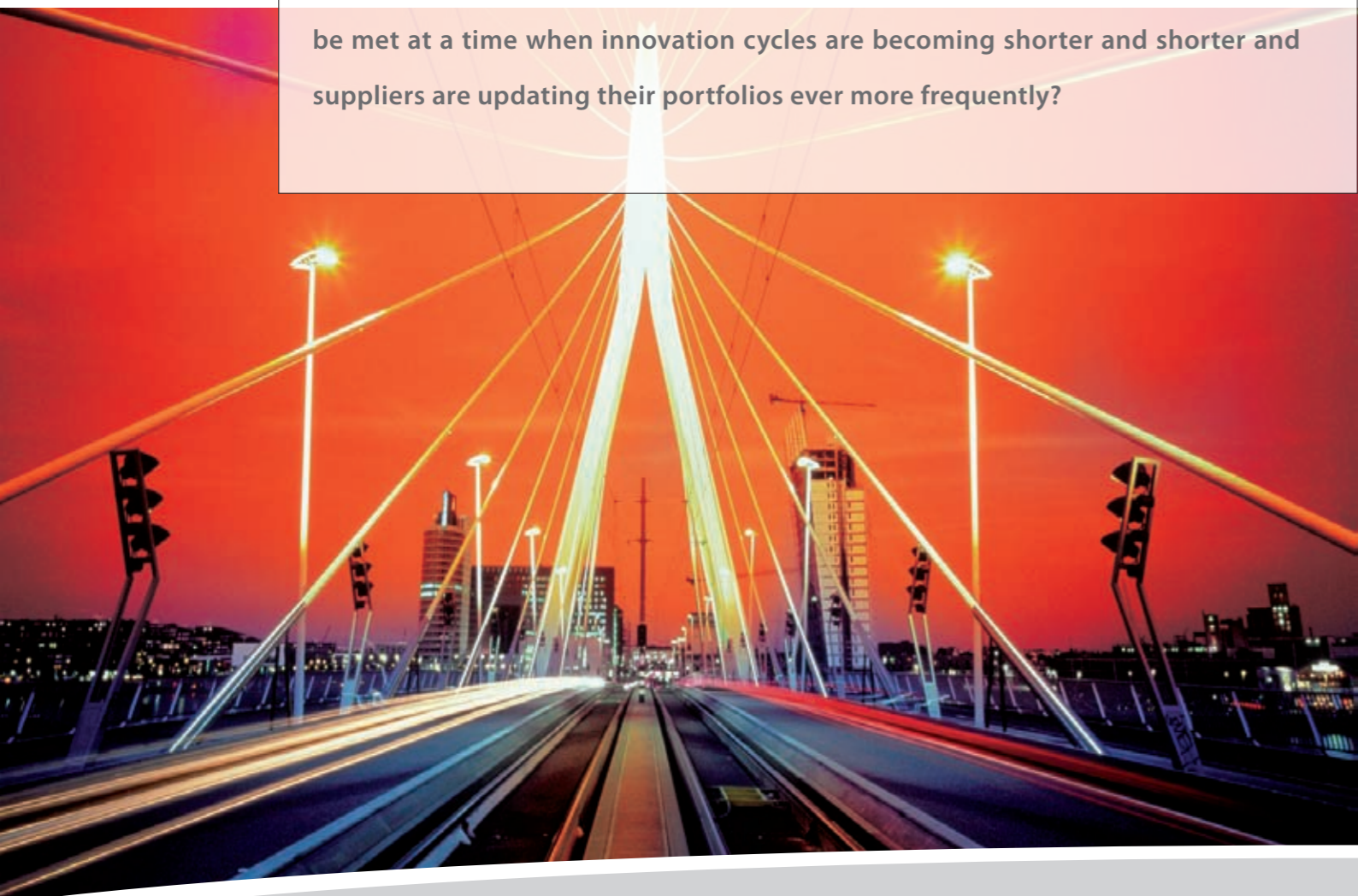


MBS Vossloh

## Obsolescence management

# Future-proof service – even after decades

Knorr-Bremse supplies braking systems for rail vehicles that frequently remain in service for thirty years or longer. Operators rightly expect their vehicles to be capable of functioning throughout their entire life. But how can this challenge be met at a time when innovation cycles are becoming shorter and shorter and suppliers are updating their portfolios ever more frequently?



In order to ensure a guaranteed supply of parts and services in the long-term, Knorr-Bremse has introduced an obsolescence management system across the entire company – from engineering, development and procurement right down to sales, commissioning and aftermarket service. The system covers not only materials, components and software but also process design.

**Working with customers to ensure reliable, economical supply**

Particular care is required where electronic units and components from external suppliers are involved. Knorr-Bremse therefore collaborates closely with its main suppliers to examine the availability of products for a large number of different systems and components. In some cases it is neither possible nor advisable to buy up large quantities of obsolescent products before production ceases; often it makes more sense to replace them by other parts that offer the same – or even improved – function. But care must be taken to ensure that such substitutes are compatible.

### ESRA – the ideal answer for upgrading electronic brake control valves

Alternative solutions become unavoidable when production of outsourced electronic components ceases. The share of the global semi-conductor market taken by the rail vehicle sector is, for example, too small for electronic component manufacturers to take it into account in their product policies.

That is why customers particularly welcome Knorr-Bremse's ESRA electronic platform. ESRA is not only used for current brake valves such as MBS or EP Compact – it is also capable, with the necessary modification, of replacing the electronic functions of older braking systems. This is where the modular design of this high-tech system comes into its own. Whatever functions are required – pressure control, traction

control, communications, diagnostics and many more – ESRA is capable of endless configuration. The interfaces of ESRA components were designed to ensure long-term retro-compatibility, even when obsolete elements have been modified.

Customers opting for this innovative version of the braking system can thus look to the future with confidence, certain of having a reliable supply of original parts.

### Ensuring long-term supply

It is always better to anticipate supply problems than to try to solve them after the event. That is why Knorr-Bremse pursues a long-term, forward-looking brake valve policy. By involving customers long before obsolescence risks turn into real problems, lasting solutions can be developed to ensure a long-term supply of value-for-money components.



Compact WSP MGS2-C

**ESRA**

ESRA stands for **E**lectronic **S**ystem for **R**ailway **A**pplications. The electronic control system is supplied by Knorr-Bremse in modular units with standardized software and can be used for virtually all control applications.



Knorr-Bremse Global Care e.V. was set up in January 2005 following the South East Asia tsunami disaster on December 26, 2004. The charitable association is dedicated to providing long-term aid to individuals who are in need as a result of environmental catastrophes, accidents, armed conflict, poverty or disease. Practical implementation of projects is actively supervised by members of Knorr-Bremse staff. The association receives an annual donation of € 1 million from the Knorr-Bremse Group. Additional information about Knorr-Bremse Global Care e.V. can be found at: [www.global-care.knorr-bremse.com](http://www.global-care.knorr-bremse.com).