

# ontrack

by Voith Turbo — N° 01.2017



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A tailor-made solution for  
the Chinese market

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p. **24**

The transformation of  
public transport

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Customized services to  
keep railcars on track

For the rail, commercial vehicles and marine industries:  
innovative solutions for the mobility of tomorrow

# At the heart of progress

# Editorial



The last 150 years have seen extraordinary developments in the mobility sector – for the world as well as for our company. Voith Turbo Mobility has accompanied and shaped these changes in the key mobility markets of Rail, Commercial Vehicles and Marine. As the technology leader, we are already developing tomorrow's solutions today. As always, innovation, maximum speed, the best quality and the highest efficiency are at the heart of everything that we do.

The success of Voith Turbo Mobility is based on the service culture lived throughout the company. Our mission is to provide world-class products, solutions and services that drive the efficiency, availability and safety for our customers today and in the future. With this first issue of ontrack, our new Voith Turbo Mobility magazine, we would like to share the passion that drives us.

Enjoy the ride and the read!

Yours sincerely,

Cornelius Weitzmann  
CEO, Voith Turbo Mobility

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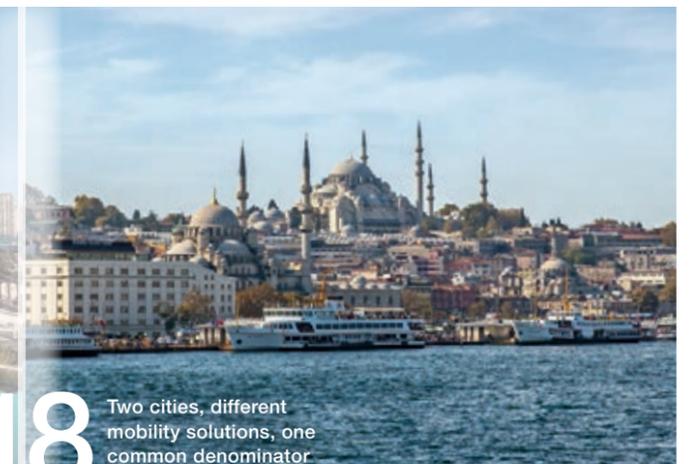
**Voith Turbo's heart beats threefold: for innovative solutions driving the future in Rail, Commercial Vehicles and Marine**



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# Individual design: a precise heart

With 500 horsepower, the Fendt 1000 Vario is the world's most powerful standard tractor. Inside, proven Voith cooling technology from rail vehicles is at the heart of its Fendt Concentric Air System (CAS). The Voith fan features innovative blade geometry and a design specifically for the 1000 Vario. Placed in front of the cooler unit and the engine, the fan draws cold air with a higher density in from outside, and compresses it further with its high aerodynamic efficiency. This allows for an enormous volume flow of up to 7 m<sup>3</sup>/s. On average, the new Voith fan requires input power of 8 kW, 50% less than a standard fan.

## Voith technology: the key to the cooling system on the Fendt 1000 Vario tractor

With its own hydrostatic drive, the Voith fan reduces energy and fuel consumption by more than 50%.



Voith supported Fendt in designing the tractor for optimum airflow. The considerably compact CAS is fitted closer to the driver's cab, allowing for a shorter, narrower hood. This gives the driver the very best of views.



# FastFacts

from the world of Voith Turbo

## RAIL

- **700 km/h** potential maximum scheduled speed with important components for front end systems, safety and power
- **-40°C**: RailPacks can survive even extreme weather conditions
- **More than 2,000** Voith T 211 transmissions have been delivered to China for special vehicles.

# 550,000

Voith Scharfenberg Couplers providing safe and reliable connections in the automatic or simultaneous coupling of mechanical, pneumatic and electrical components.

## COMMERCIAL VEHICLES

- **300,000 DIWA** automatic transmissions have been delivered worldwide.
- **Up to 12 % less fuel** consumption with Voith Stop-Start Technology.
- **2,000 DIWA SmartNet** telemetry system installations worldwide
- **90% of all vehicle braking operations** are wear-free with Aquatarder SWR / 50% less installation space with Aquatarder SWR

↓  
**150 years' experience**  
↑

## MARINE

### Propelling tradition

The Staten Island Ferry has been running between Manhattan and Staten Island since 1905. The ferry, which runs continuously, carries over 22 million passengers annually on a 5.2-mile run between the St. George Terminal on Staten Island and the Whitehall Terminal in Lower Manhattan. In the future, the City's Department of Docks and Ferries will further put its trust in Voith Schneider propeller technology.

**4,332 Voith Schneider Propellers (VSPs) have been sold. More than 950 tugboats run with VSPs. Some VSPs have been in use for more than 50 years.**

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# innovate

An insight into innovative ideas, solutions and the people behind them

## Train components inspired by nature

Trees have to be firmly rooted to the ground in order to withstand the enormous forces created by strong winds. At their base, where they meet the roots, they form transitions between the trunk and the ground – naturally making use of the notch effect to reduce stress. The same principle gave inspiration to

Voith's innovative bionic toothing. "Utilizing this geometry not only makes the toothing more durable, but also allows for narrower designs in gearwheels. This results in lighter gear unit weight and also saves valuable centimeters of installation space,"

explains Steffen Pyka, Product Management Rail Drives with Voith. Adapted to regular-sized gear-tooth bases, the principle allows for more teeth to be fitted. The effect: a reduction of noise emissions of up to 3 dBA. Which is why Siemens is considering Voith's bionic toothing for the Mireo family, its next-generation regional trains.



Steffen Pyka,  
Voith Product Manager Rail Drives

A precarious profession: truck drivers in China need the best of brakes to deal with the steepest and longest slopes of roads.

# Peak results, safety first

**11 km** downhill slope

**99** tight bends



An entrepreneurial drive led to the hydraulic retarder for China's extreme road conditions. Manufacturers and truck drivers appreciate the competitive solution that offers maximum safety.

Tourists flock to the top of the Tianmen Mountain National Park in China to enjoy a short walk across a terrifying skywalk — a 100-meter-long glass path offering staggering views across beautiful mountains and of, quite possibly, the world's most dangerous road: Tongtian Avenue, or the "Avenue toward Heaven." Just 11 kilometers long, it reaches from 200 meters to 1,300 meters above sea level, a journey made possible only by 99 steep twists and turns, some at a hair-raising 180-degree angle. It is not a place for the faint-hearted. Or for weak brakes.

Although the road is unique, it is symbolic of the treacherous routes Chinese truck drivers face daily. Sharp bends, steep grades and narrow paths create conditions that are unmatched. They are also a reason for the high traffic accident and mortality rate in China. On the Yaxi highway, for instance, a 240-kilometer road that connects Ya'an and Xichang, there are at least a thousand accidents each year, as well as around 100 deaths. One stretch features a 51-kilometer continuous zig-zag of a slope with a maximum of six degrees. Navigating the highway requires dexterous driving skills, nerves of steel and the most reliable of brakes. After human error, mechanical failure accounts for the second-largest percentage of truck accidents, with brake failure often as the main cause.



↓

### Safety benefits

As well as reducing the operating costs of the vehicle, the VR 115CT also extends the service life of the brakes and tires, and is better for the environment.

- 1. High braking power
- 2. Integral cruise control
- 3. Stress-free driving
- 4. Payback within a year



Truck drivers are now able to meet the commercial demands of the market: higher payloads, higher mileage and higher average speeds.



- 1 Sinotruk: safe behind the wheel.
- 2 Increasing safety, reducing costs: the VR 115CT is an offline retarder driven by a step-up gear chain.

#### Driven by the challenge

The solution? For maximum safety and optimum braking, truck drivers and manufacturers in China install the Voith Retarder VR 115CT. Only trucks fitted with this retarder are able to handle the Yaxi highway slopes in all weather conditions. Traditionally, trucks would use a water-spray system to cool tires and brakes. A simple solution, but also one that quickly damages equipment. And in winter, it would turn the highway into a slippery skating rink.

**"We have spent years carefully calculating how to best meet the most grueling environment and road conditions on the most demanding highways in the world,"** explains Joachim

# Tailored to China

As the undisputed market leader in the heavy truck sector, the Voith Retarder VR 115CT has become a synonym for wear-free continuous braking in trucks and buses, giving truck drivers better control over the energy generated on downhill runs and allowing them to exploit the truck's kinetic energy. In conjunction with the engine brake, the VR 115CT guarantees an optimum braking effect — at low and high speeds. As well as maximum safety in any driving situation.

The extremely robust retarder, designed specifically for Chinese trucks, is fully geared towards the working environment of heavy trucks in China. Locally manufactured, it meets the requirements of the Chinese domestic customers on high braking quality for trucks.



[www.voith.com/retarder115ct](http://www.voith.com/retarder115ct)

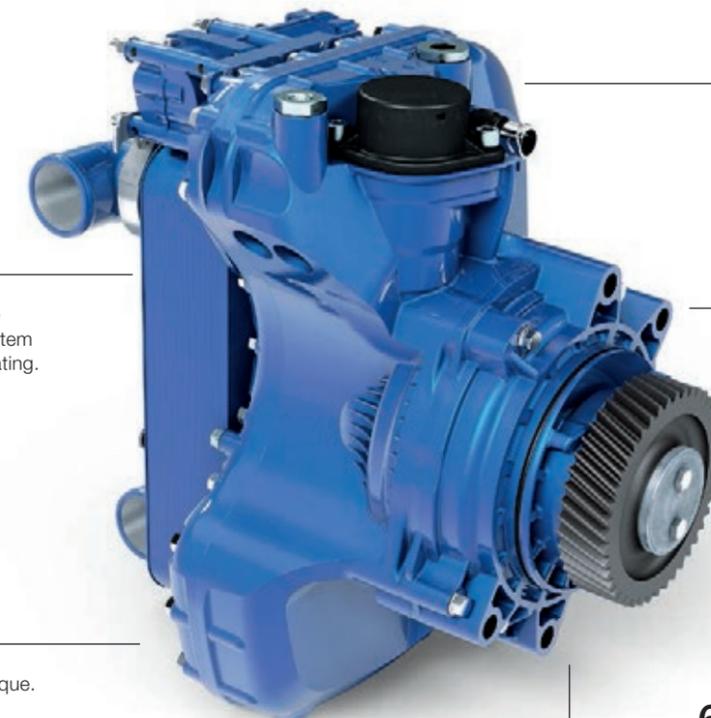
## Safe: the Voith VR 115CT

### In control

Temperature sensors at the control unit monitor the system and prevent it from overheating.

**3,500 Nm**

Maximum rated braking torque.



**52 kg**

Lightweight, but robust. The reduced weight translates into increased efficiency.

**Small but powerful**

With a gear ratio of two in the integrated step-up gear chain, smaller retarder dimensions permitted with no loss of performance.

**2,650 rpm**

Maximum speed at the propshaft.

**6.8 liters**

Autonomous oil supply. The oil as an operating medium is supplied with compressed air. During braking with the retarder, the kinetic energy of the vehicle is converted into heat and dissipated to the oil.



**80%**  
less brake  
dust emissions



**“For the same task, I now save a full extra day to cover the same distance.”**

Gao Liang,  
truck driver for the Brother Logistic Company

Kernke, Vice President Retarder, Voith Turbo. On top of dicey downhill runs, Chinese truck drivers also have to contend with enormous distances. Avoiding breakdowns is therefore also a high priority.

**Meeting the needs**

At the forefront of the research was a desire to improve overall efficiency of the trucks, to lower costs and to reduce accidents, all in an eco-friendly way. This ambitious entrepreneurial approach led to the rapid development of the VR 115CT. Working together with local OEMs, including SinoTruk – China’s first heavy-duty truck manufacturer, headquartered in Shandong Province – the VR 115CT has been tailored specifically for the toughest of environments. Since 2014, it has been manufactured in Shanghai for the Asia-Pacific market. **“This local base means a tighter turnaround and a design better adapted to the region,”** says Martin Wawra, Managing Director Mobility Voith Turbo, China.

On the road, what difference does the VR 115CT make? Gao Liang, a truck driver for the Brother Logistic Company who travels from Kumux

3

A local approach for a tighter turnaround and a much better fit: The VR 115CT is tailored for China.

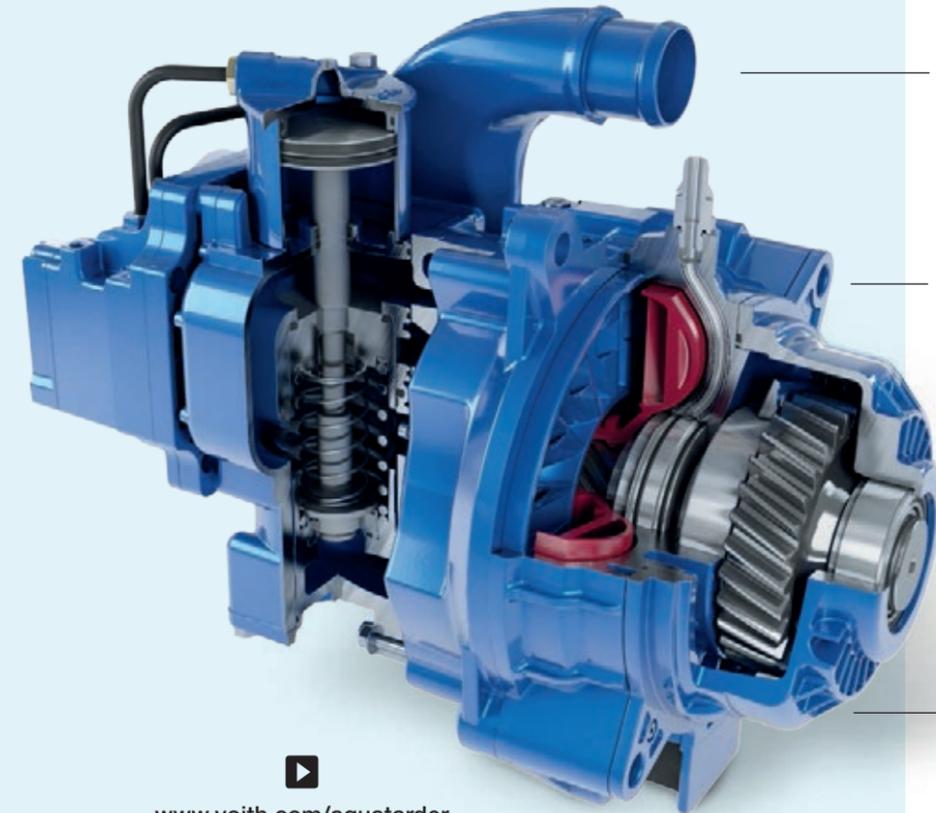
Saltworks to Toksun County every day, is convinced of the benefits. His SinoTruk heavy-duty truck is equipped with the VR 115CT. **“For the same task, I now save a full extra day to cover the same distance with a truck with the Voith Retarder,”** Liang explains. As a result, he can expect to double his income. The lifetime of the tires has doubled, while for pads it has increased sixfold. This optimizes the operation efficiency, reduces maintenance costs and allows for a higher average vehicle speed overall. It means the VR 115CT is amortized in a year.

**A safer future**

Until recently, Chinese trucks were not required to be fitted with a retarder. Tightened road-safety and environmental regulations implemented in 2015, however, have changed that. In a country with around 4 million heavy-duty trucks currently on the road, and roughly an additional 600,000 licensed each year, the VR 115CT provides an economical breakthrough that will drive the transformation of truck transportation. It is a shift that could result in safer roads. In the European Union, for instance, tighter legislation has resulted in a 50% drop in road deaths and injuries since 1992, despite an increase in truck transport by over 70%.

**“Our design has led to a major overhaul of the goods haulage industry in China,”** says Kernke. **“The VR 115CT is an excellent fit for the hazardous conditions and demanding safety requirements. The steep sales increase is proof we are on the right track.”**

**Efficient: the Voith Aquatarder SWR**



[www.voith.com/aquatarder](http://www.voith.com/aquatarder)

**750 kW/1,020 hp**

Impressive endurance braking power capacity of retarder and engine brake.

**50%**

less installation space required than conventional retarders, thanks to the compact design.

**42 kg**

light, a total of 35 kg lighter than the predecessor.

**90%**

of all braking operations are carried out by this secondary water retarder.

**3,500 Nm**

high braking torque at the propshaft.

**Braking with water**

The realization that a truck’s cooling water could be put to better use – as well as the desire to find a more sustainable and economical solution – led to the development of the world’s first ever water retarder. And an efficient one at that.

The Voith Aquatarder SWR, a secondary braking system, is based on the principles of hydrodynamics and makes use of the engine’s own coolant as an operating medium. The benefit? A maintenance-free retarder that only weighs 42 kilograms, takes up 50% less installation space and ensures there’s no wear and tear during braking. Or dust, for that matter.

With the next generation of retarders, the ECO-SWR, the unit fully disconnects from the drive shaft in idling mode, providing even further improvements in fuel efficiency and vehicle emissions. The future is even cleaner.



Targeting emissions and reducing costs: the Voith Aquatarder SWR is unique in function, form and efficiency.

# Keeping it steady



The harshest of environments in the open sea are no match for the Kroonborg, the world's most capable walk-to-work vessel for the offshore industry.

## Key figures

**2 x 1,800 kW**

Input power provided by two Voith Schneider Propellers.

**1,000 kW**

Power of each of the two Voith Inline Thrusters installed.

**75%**

How much the ship is able to compensate for rolling due to the Voith Roll Stabilization.

**20**

More operating days a year.

Fierce winds and numerous hydrocarbon reservoirs make the North Sea a prime location for generating renewable energy and a major site for the gas and oil industry. Ideal for energy maybe, but the high waves, powerful winds and strong currents make it unpredictably hostile for the people who work on offshore wind turbines and platforms. Unless, that is, you are on board the Kroonborg, the world's most capable walk-to-work vessel.

As such, the Kroonborg can absolutely secure the safe, smooth and efficient transfer of crew to remote offshore workplaces, in the most challenging of environments. Designed and operated by Royal Wagenborg, the Dutch shipping company, and built by Niestern Sander, the Dutch shipyard, it is a unique vessel that enables people to literally walk to work in the open sea, even when the waves are more than 3 meters high. The purpose-built walk-to-work vessel is kept perfectly propelled by Voith Marine Technology so that the crew can access their workplace via a bridge, safe from pretty

much whatever Mother Nature cares to throw at them.

Up on the main bridge, Gerrit de Haan, captain of the Kroonborg, is clearly relishing being at the helm, precisely steering the ship with the lightest of touches, using what appears to be a superior joystick from a game console. It is part of the system that is responsible for the exact nature of the vessel's superior maneuverability and



**Gerrit de Haan**  
Captain of the Kroonborg

ground-breaking dynamic positioning (DP) system. This is achieved through a sophisticated combination of innovative propulsion, position-control and drive systems from Voith Marine Technology, which is concisely summarized in a simple maritime acronym: "BRIDGE."

**Immediate response**

The ship's main propulsion system is built on two Voith Schneider Propellers (VSP 28R5 ECS/234-2), the bow thrusters on two Voith Inline Thrusters (VIT 2000-1000 H), and it features an electronic Voith control system, which are all complemented by Voith Roll Stabilization. The results are convinc-



**The Voith Schneider Propeller (VSP)**  
Combining propulsion and steering in one unit, and delivering thrust rapidly in all directions, the VSP is a precise vessel propulsion system. For efficient dynamic positioning under extreme conditions.



**The Voith Inline Thruster (VIT)**  
As well as ensuring a significant reduction in noise and vibration, the VIT has an environmentally friendly design thanks to its water-lubricated bearing system. For a smoother ride.

**BRIDGE**

**Six benefits from Voith Marine Technology**

- Best Dynamic Positioning performance
- Reduced fuel consumption
- Increased comfort
- Downtime reduction
- Great productivity in all conditions
- Effective, innovative and successful offshore solution



[www.voith.com/bridge-offshore](http://www.voith.com/bridge-offshore)

ing, keeping the vessel on position to the meter, close to the offshore construction, and enabling precise compensation for vessel movements caused by wind, waves and currents, as the captain can testify: "It is quick, reliable and efficient," he says. "The DP capability of this vessel with the Voith Schneider Propeller is direct, and its precision-keeping is very good," he confirms. "The response of the Voith Inline Thrusters is enormous."

This is exactly the kind of reaction that Wagenborg was expecting when they called on Voith's expertise to support them in equipping a ship that would be able to withstand the harsh environment of the North Sea and the demanding requirements of its end user, NAM/Shell UK. The company needed the vessel to be in service for a minimum of 320 days a year, for instance. The result would be a ship that is active for an incredible 340 days, or over 8,000 hours. "We used Voith because we need the highest standard of quality," says Wilfried Boelens, Operations Manager, Wagenborg. "In terms of reliability and efficiency, Voith products are clearly proven by this vessel."

From the outset of the new-build project, through the design phase to commissioning, Wagenborg placed a clear emphasis on safety, sustainability, operational efficiency and passenger comfort. Fuel consumption is kept low, even lower than expected, which reduces operational costs. In 2015, the Kroonborg was awarded the prestigious "Ship of the Year" accolade by the Royal Netherlands Society for Marine Technology, in clear recognition that its design and functionality has raised the bar for the industry. Dr. Dirk Jürgens, Vice President of R&D Voith Marine Technology, is equally convinced, as he confirms: "There is simply no other crew transfer vessel that is able to operate with the same positioning accuracy, safety or reliability." \_\_\_\_\_



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**transform**

The people and technology shaping the industry

**Unique propulsion**

Passengers on wind farm support vessels are usually in for a bumpy, noisy and risky ride. Not so with Trearddur Bay, a 21-meter crew transport vessel operated by the Welsh ship operator Turbine Transfers, and the first of its kind to be fitted with the customized Voith Linear Jet. "We often get complimented on how smooth and quiet it is," confirms Anthony Robson, master of the ship since its launch in 2015. Noise, vibration and emission levels are kept extremely low, while fuel efficiency, crew safety and operative maneuverability are increased, even at speeds of 30 knots in rough seas. The secret lies in the unique propulsion design of the Voith Linear Jet, which combines the advantages of a conventional propeller with those of a water jet. "It makes the best of both," adds Robson.



Watch the Video:  
[www.voith.com/vlj](http://www.voith.com/vlj)

# Megacities —

The ever-increasing challenges to urban mobility come in many forms, and approaches to address them vary – as is evident when looking at two such different cities as São Paulo and Istanbul. The common denominator: Voith technology.



① **SÃO PAULO:** To battle congestion, Brazil's largest city is investing to improve its bus and rail systems.

Commuting is one of the biggest challenges to the people of São Paulo, the Southern Hemisphere's most populous city. "On average, commuters lose over two hours in traffic due to congestion," says Rogerio Pires, Vice President KAM CV Americas & Mobility Brazil with Voith. And while

the majority of the population uses public transport – more than 10 million passengers daily – the number of private cars is still increasing. To alleviate traffic, the city has been investing in the bus and rail systems. "Dedicated bus lanes, low-entry design, higher vehicle capacity and more embedded technology in the vehicles, plus electronic monitoring of the almost 15,000 buses in the city, have been implemented to improve efficiency and quality," says Pires. Thanks to a deep knowledge of local conditions, Voith has developed a close cooperation with fleet operators and OEMs and has been able to play a major role in the continuous improvement of buses and metro cars in the city. Voith technology is contributing to lower fuel consumption per transported passenger, lower operational costs and higher vehicle availability.



# — in motion

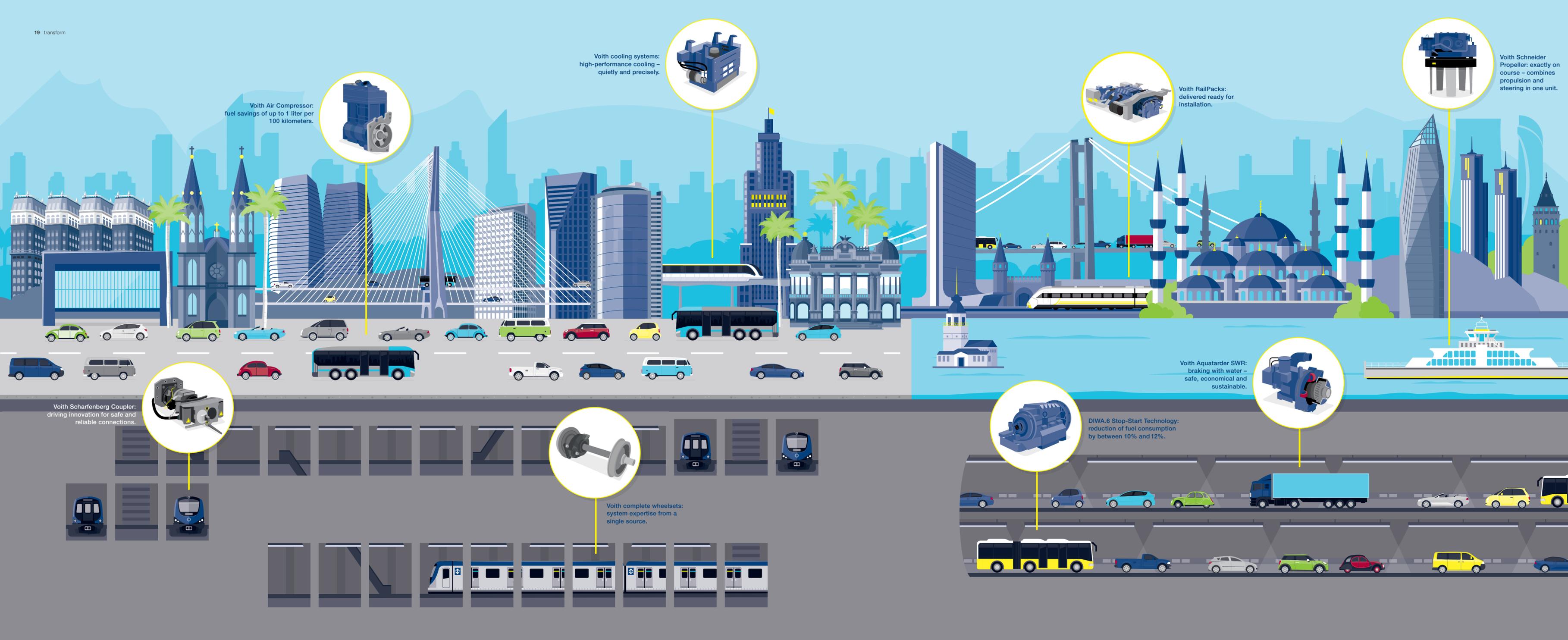


The unique geography of Europe's largest metropolis is also its biggest challenge where mobility is concerned. 15 million people live in the transcontinental city divided by the Bosphorus. "The last 10 years have seen a lot of improvement," explains Mert Özenç, Head of Voith Mobility in Turkey, "most significantly in bringing the two halves of the city closer together with the Eurasia and Marmaray tunnels." While the Eurasia tunnel alleviates traffic on the roads, Marmaray is reserved for rail vehicles. Since the tunnel was opened, rail use in the city has soared from 4% to almost 30%. The Rotem cars in use here are fitted with Voith couplers, and Voith technology can also be found in the varied public transport system – from trams and metros to buses and even ferries. "Istanbul has undergone a big development in the last 10 years



② **ISTANBUL:** By expanding its infrastructure, the ancient city on the Bosphorus has alleviated its transport problems.

but still needs to do more," says Özenç. "Luckily the government recognizes this." And so plans for further development are already underway: the metro Istanbul wants to extend their lines to 640 kilometers by 2023. A big step, considering that in 2004 its network comprised just 45 kilometers.



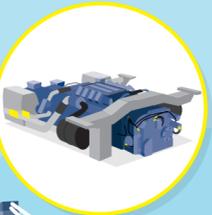
Voith Air Compressor:  
fuel savings of up to 1 liter per  
100 kilometers.



Voith cooling systems:  
high-performance cooling –  
quietly and precisely.



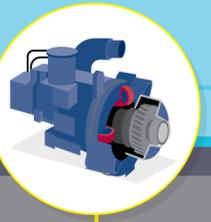
Voith RailPacks:  
delivered ready for  
installation.



Voith Schneider  
Propeller: exactly on  
course – combines  
propulsion and  
steering in one unit.



Voith Aquatarder SWR:  
braking with water –  
safe, economical and  
sustainable.



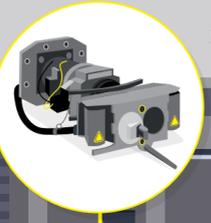
DIWA.6 Stop-Start Technology:  
reduction of fuel consumption  
by between 10% and 12%.



Voith complete wheelsets:  
system expertise from a  
single source.



Voith Scharfenberg Coupler:  
driving innovation for safe and  
reliable connections.



Changing natural environments, socio-economic pressures, demographic factors and increasing urbanization – these are among the most pressing issues impacting urban mobility to varying degrees in megacities such as São Paulo and Istanbul.

Aware of changing demands, Voith Turbo is aligned with these global megatrends. And with its unique technologies and a global network, Voith Turbo offers high-tech products and services for a wide range of public transport and supply solutions:

→ **On the tracks**

**Efficient and highly reliable**  
From light rail and trams, to metros, monorails and high-speed trains – Voith products and systems ensure greater efficiency through higher speeds and exceptional reliability.

→ **On water**

**Safe and environmentally friendly**  
In transporting passengers, safety is of the highest priority, so ferries need to cope with currents, crosswinds and tidal changes in various water depths. Requirements that vessels easily meet with Voith propulsion and steering systems.

→ **On the roads**

**Economical and sustainable**  
Compact, light, reliable – these are the essential requirements for components and systems for commercial vehicles. Always in the foreground: that every drop of fuel is used as efficiently as possible.

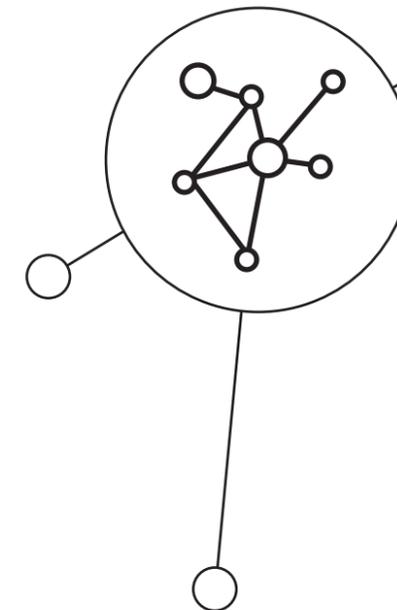
# A much-needed transformation

Today, cities are home to 54% of the world's population – a heavy burden for urban mobility solutions. Alain Flausch, secretary-general of the International Association of Public Transport (UITP) in Brussels, talks about how mobility will have to change for livable cities around the globe.

Which critical global issues are driving future mobility? There are several factors affecting urban life worldwide. Cities are growing, so urbanization is still a major trend – and it will continue. By the same token, mobility in the city is getting much more difficult because of congestion. And then there is also climate change. Pollution is a big problem – which really means that the model of the livable city is at stake. Mexico City or São Paulo, for example, are facing major challenges. Fortunately, in Europe the situation is better. But cities like London or Paris may develop in that direction if nothing is done. People really need to wake up and realize that we cannot continue with the same model if we want humanity to survive.

What are the most discussed mobility trends at the moment? We are mostly talking about mobility that is clean, shared and connected. Because the major issue is single-person cars, simply because they are taking up too much space – aside from pollution, that is. This is something that public transport already provides to some extent: it means

## connected



## Future of Mobility

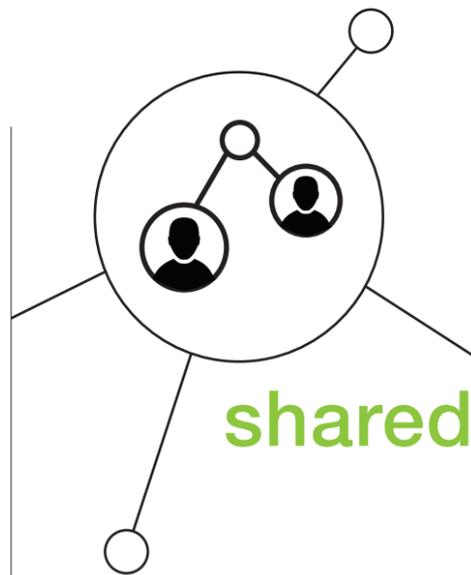
sharing and it is getting cleaner all the time. It is not yet digitalized enough but it is on the verge of being so. Public transport is not always the best option, however, because it usually does not take people all the way. And in low-density areas it also is not very efficient. A bus transporting one passenger at night really is unsustainable. This is where digitalization has the potential to change things significantly.

In which way? Through digitalization the way to meet demand and supply can be optimized. When I started working in public transport years ago, it was like going in blind. We conducted surveys every two years or so to see if lines were properly occupied or not, and on that basis we decided the number of buses to utilize. But we did not know exactly. Digitalization allows for smarter decision-making, as it

gets you intelligence on how to best deploy your resources. And it enables on-demand transport, especially in low-density areas. It is also a way to combine the heavy backbone of public transport with agile mobility services, which are less expensive and more suitable for smaller numbers of people.

\_\_\_\_\_ **How relevant will automated driving be?** Automated vehicles (AV) are definitely a trend that should be mentioned. Even though this is more of a long-term perspective. Driverless buses will come – they are already in test and pilot phases. But the transition period will be longer than what most people foresee today. We might see some AV in time but mostly still normal cars. And once they are introduced, they also need to be shared. If regular cars are just replaced by AV, the danger is that there will be even more cars if they are not shared. There will be an intermediate stage with fleets of AV and fleets of normal cars. Cities and public transport organizations will be a good candidate for running them because of their experience in organizing fleets of buses, etc. Before that happens, however, there are legal issues, like who takes responsibility, and secondly the issue of cybersecurity, that need to be clarified. That is going to take a while. I believe we will get there step by step but I do not see 100% AV for many decades.

\_\_\_\_\_ **How will urban infrastructures have to change to accommodate new mobility concepts?** A critical factor will be the integration of all modes of transportation. The future will be reviewing the whole system of urban mobility with the help of the enabler that is technology and then to collaborate with partners offering smart and innovative mobility solutions.



shared



**About UITP**

The International Association of Public Transport (UITP) is an international non-profit organization working to connect public transport authorities and operators, policy decision-makers, scientific institutes, and the public transport supply and service industry.

Advocating public transport and sustainable mobility as well as promoting innovations in this sector, the UITP offers a platform for worldwide cooperation, business development and the sharing of know-how among its 1,400 members from 96 countries.



**“The pressure on decision-makers to transform cities is greater than ever.”**

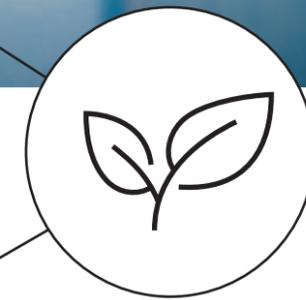
**Alain Flausch**  
secretary-general of UITP

Public transport investing in car sharing or bike sharing for example but leaving the operation to the provider because they are the ones who know best. It will be vital that this collaboration results in a system that is easy to use. After all, that is what makes cars so attractive, that they are convenient. Solutions like the smart card, which can be used for public transport, car sharing or bike sharing allow users to easily switch between modes of transportation.

\_\_\_\_\_ **To what extent are cities today already prepared for “Mobility as a Service”?** There are always pioneers that are ahead of their time. Vienna and Helsinki have already started with this. In Germany, the VDV (Association of German Transport Companies, of which Voith is a member) is steering a group of about 20 companies that are about to create a platform for Germany. And there is another initiative in Paris. I believe it is like a puzzle. There will be initiatives first on a regional or national level and subsequently we have to make sure that those platforms can talk to each other in terms of IT



clean



language. So that these services may be used across countries as well.

\_\_\_\_\_ **Big transformations of transport have been predicted before – is it really happening this time?** The pressure on decision-makers to transform cities is greater than ever. Every year, 3.5 million people worldwide die from pollution. Traffic jams and congestion are also becoming a political issue, because people are wasting hours, which is a huge

economic cost. There is a very real risk for cities that once there is congestion they will lose ground in terms of competitiveness. Take London, for example. A few years ago, it was so congested that the business community actually supported the introduction of a congestion charge to help alleviate traffic. Next to ecological concerns, economic considerations are becoming more and more important and are pushing everybody into the transformation. So yes, I definitely think it will happen. \_\_\_\_\_



**Alain Flausch in his office at UITP's headquarter in Brussels.**

# Service all around



[www.voith.com/service-kiel](http://www.voith.com/service-kiel)



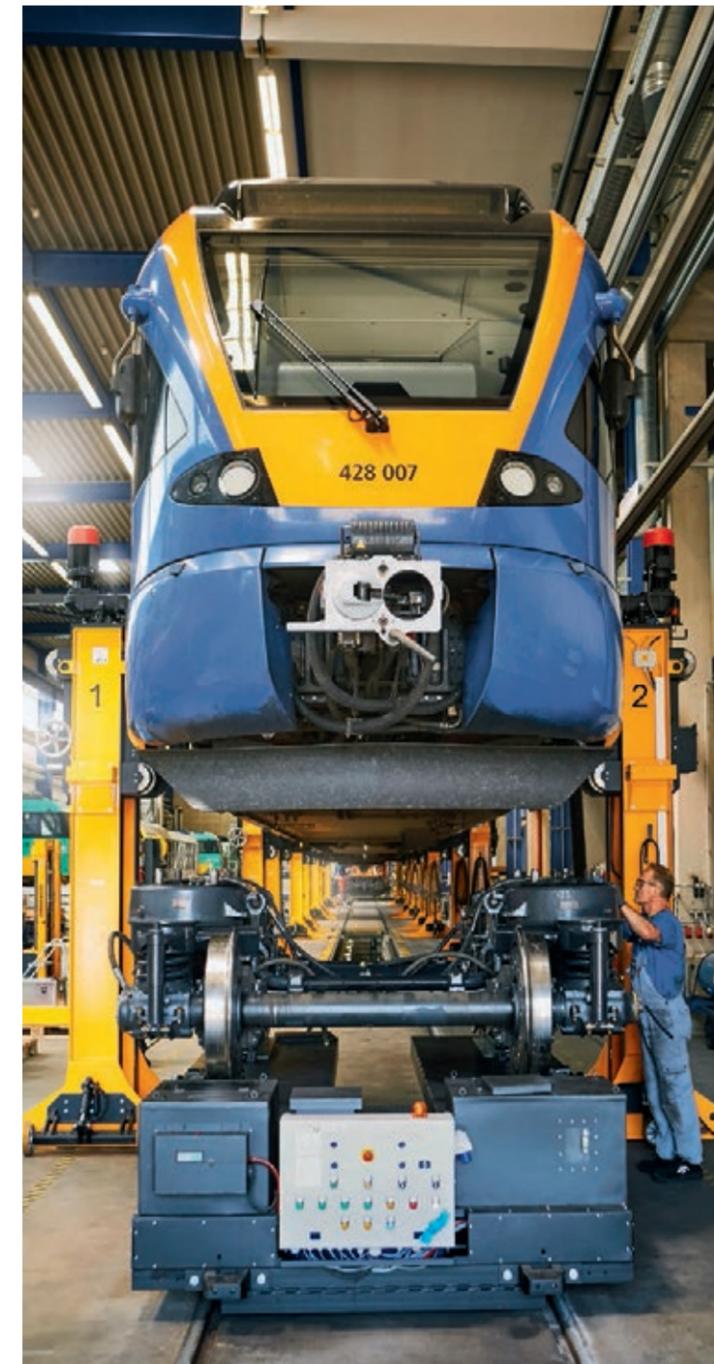
## Bogie Workshop

- The bogie workshop includes a wheelset press and test rigs and allows Voith to perform bogie overhauls more quickly.
- Almost everything can be done in-house, there are few interfaces, and there's no need for complicated loading and transportation.

The Voith Rail Service Center in Kiel combines years of engineering experience with modern solutions to provide rail customers with the best services.

Walking into the 16,000-square-meter production site of the Voith Rail Service Center in the north German city of Kiel, the first thing that immediately catches the eye is a 74-meter train suspended in its entirety about 3 meters above ground. The train, from local rail service provider cantus Verkehrsgesellschaft mbH, is here for a bogie overhaul – one of the services offered by Voith Turbo and part of its comprehensive portfolio.

Since the end of 2014, Voith offers a wide range of services for rail vehicle operators. “We are not a typical maintenance provider,” explains Ulf Klaua, Director Sales of Voith Turbo in Kiel. “Instead of simply restoring components to their original state, we are also able to suggest and carry out improvements, effectively modernizing vehicles.” This expertise stems from the history of the site, where between 2005 and 2014 Voith manufactured its own locomotives. “The engineering know-how we have means that we understand railway vehicles from A to Z,” says Klaua. A know-how appreciated by customers: “We awarded the first contract to Voith Turbo for the repainting of our trains about two years ago. Even though they were then a new player in the market, we were confident of receiving good results because of their experience,” explains Christoph Engel, Maintenance Manager for cantus. Only a year later, Voith won a second contract, this time for the bogie overhauls of all of their 21 trains. “Voith’s overall concept was convincing, especially the flexibility and very



The cantus FLIRT (Fast Light Innovative Regional Train) is 74 m long and weighs 125 metric tons.



## Repairs & Maintenance

- In addition to classic maintenance and repair work, the Voith service technicians perform fleet repainting tasks.
- Thanks to its engineering experience, the Center is also capable of performing a range of modernization measures on vehicles.



The Service Center in Kiel is located directly at the Kiel Canal, which connects the North Sea to the Baltic Sea.

short processing times they offered,” says Engel. In the bogie workshop, which includes a wheelset press and test rigs, bogies and their components are overhauled in-house, there are few interfaces, and there’s no need for complicated loading and transportation to remove the wheels and re-install them again. As a result, lead times are considerably reduced. “Depending on the scope of the tasks, we are able to finish a bogie replacement for cantus within five days,” says Dieter Wolfgram, Account Manager with Voith, “and high availability of their vehicles is of course crucial for our customers.”

The Rail Service Center is exemplary for Voith’s redefined service strategy. While maintenance and spare parts remain pivotal, full-service solutions are becoming more important. “Twenty years ago, train operators had their own workshops and know-how. Today they focus on their core business, which is to transport passengers or freight from A to B, and the logistics that entails,” explains Klaua. Consequently, operators seek partners they can entrust the maintenance of their fleets with. “We have customers that ask for full-service concepts for their trains for the next 10 years. That usually entails monitoring the trains,” says Klaua. Here solutions like Voith’s OPRA

## “Today operators want to focus on their core business, which is to transport passengers or freight from A to B.”

**Ulf Klaua**  
Director Sales, Voith Turbo Kiel



Life-Cycle-Management System come into play. OPRA gathers and interprets status data, thus enabling condition-based maintenance. “It allows us to advise our customers on when best to perform certain tasks,” says Klaua. “More and more customers realize that there is a lot of potential in data management.” As a consequence, automated predictions support customers in avoiding downtimes and increasing efficiency. Here again Voith’s engineering expertise puts the company in a unique position. “We can implement these solutions not only in new trains, but also in rail vehicles that have been running for years,” explains Klaua. \_\_\_\_

### Digital Solutions

- OPRA makes it possible to identify weaknesses and introduce targeted measures, to reduce technical failures.
- Logistics and communications become more efficient.

# reflect

Key trends, new developments and industry insider opinions

## A new generation for buses

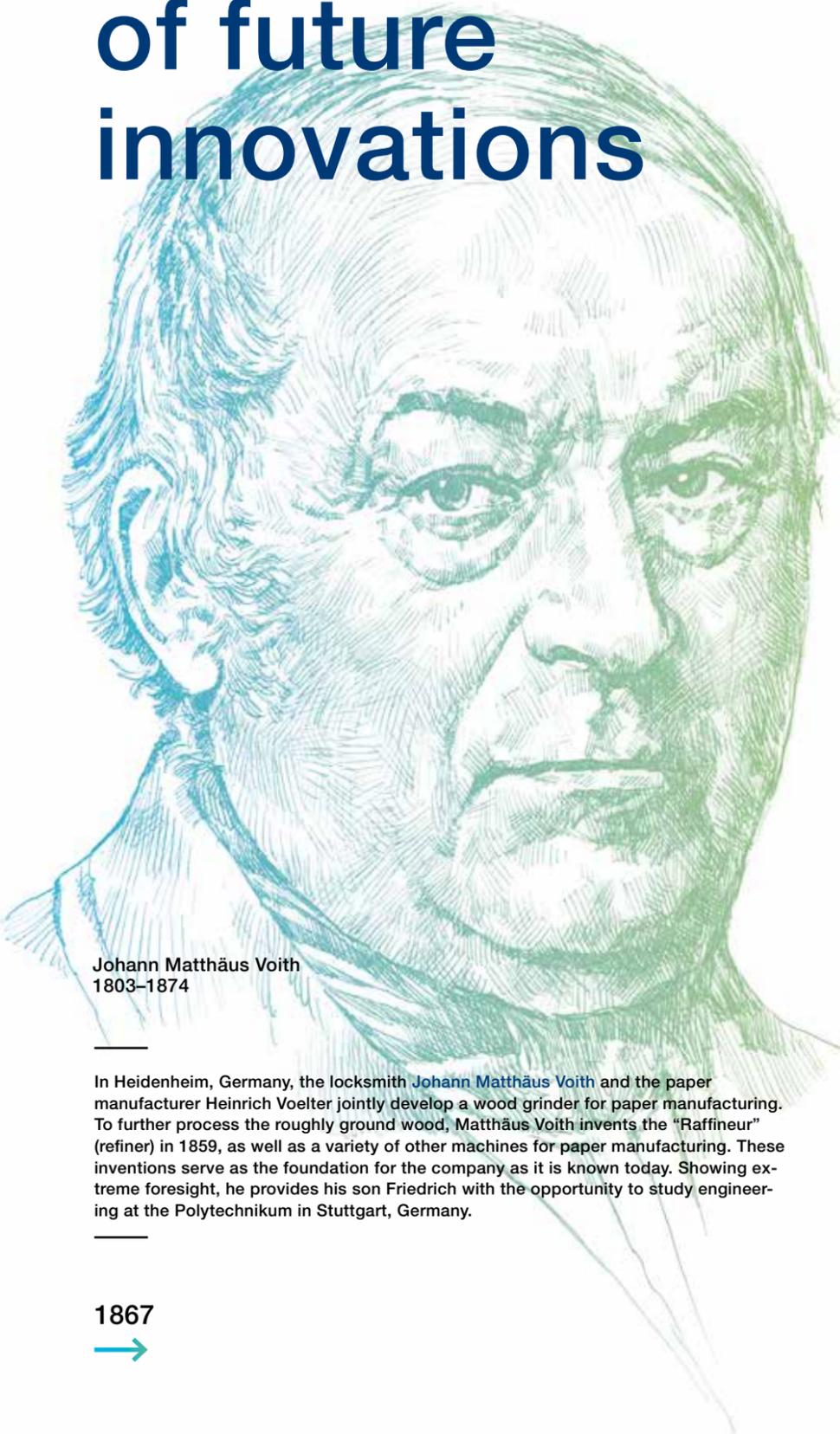
Recognizing the need for efficient and sustainable solutions, Voith is developing a concept for the next generation of the DIWA automatic transmission for buses. Optimized for minimum fuel consumption and reduced CO<sub>2</sub> and noise emissions, the concept keeps the proven differential converter principle. The integrated central recuperation unit redefines the role of the transmission in the overall system of the bus.



Watch the Video:  
[www.voith.com/diwa](http://www.voith.com/diwa)



# The roots of future innovations



Johann Matthäus Voith  
1803–1874

In Heidenheim, Germany, the locksmith **Johann Matthäus Voith** and the paper manufacturer Heinrich Voelter jointly develop a wood grinder for paper manufacturing. To further process the roughly ground wood, Matthäus Voith invents the “Raffineur” (refiner) in 1859, as well as a variety of other machines for paper manufacturing. These inventions serve as the foundation for the company as it is known today. Showing extreme foresight, he provides his son Friedrich with the opportunity to study engineering at the Polytechnikum in Stuttgart, Germany.

1867



- **1867**  
The family adventure begins on January 1, 1867, when Friedrich Voith (1840–1913) takes over the locksmith business, Maschinenfabrik J.M. Voith, from his father, Johann Matthäus Voith (1803–1874).
- **1869**  
Voith's innovative first patent for a wood grinder lays the foundation for modern papermaking.
- **1870**  
The first Voith turbine leaves the workshop: a breakthrough for hydropower technology.
- **1903**  
Voith opens its first foreign subsidiary, in St. Pölten, Austria.
- **1903**  
Voith receives an order for the delivery of 12 Francis twin turbines to a power plant at Niagara Falls, on the US-Canada border. With 12,000 HP, they are the largest turbines of their time.
- **1928**  
The *Torqueo*, the first ship equipped with a Voith Schneider Propeller, leaves the dock.
- **1934**  
Voith delivers the first turbo transmissions to be used for diesel-hydraulic rail buses of the Austrian railway.
- **1949**  
Voith presents the first automatic transmission for buses, the Voith DIWA transmission.
- **1950**  
Voith develops a new concept for a tug boat: the Voith Water Tractor, equipped with the Voith Schneider Propeller.

- **1956**  
Opening of the Voith Turbo location in Crailsheim, Germany. First turbo transmissions delivered to the USA.
- **1960**  
First Voith Retarder introduced.
- **1995**  
Voith sells the 100,000th retarder and the 25,000th turbo transmission.
- **1998**  
Voith takes over Scharfenbergkupplung, Salzgitter in Germany.
- **2000**  
Voith presents the Voith RailPack, a complete drive system for diesel railcars, including diesel engine, turbo transmissions, couplings, cooling systems, universal joint shafts and final drives.
- **2001**  
Founding of the Voith Turbo Power Transmission in Shanghai, to drive the expansion in the Chinese mobility market.
- **2002**  
Voith supplies 480 final drives for the Metro in Delhi, India.
- **2007**  
Voith delivers 200 Voith turbo transmissions, 542 final drives and 200 joint shafts for 107 new regional trains in Spain, built by the OEM CAF.
- **2011**  
Voith and Audi form a partnership to drive the development and highly automated production of fiber-reinforced materials for use in future automotive projects.

- **2011**  
Voith launches a two-stage aluminum air compressor.
- **2012**  
Voith launches the Voith Secondary Water Retarder, the first secondary retarder that uses water for braking.
- **2015**  
Introduction of the DIWA SmartNet, the integrated solution for driveline monitoring and quick and direct access to operational data.
- **2017**  
Voith celebrates its 150th anniversary – and looks ahead to the next milestone, with the motto “Welcome to the Next 150 Years.”

Friedrich Voith  
1840–1913

For 150 years, the Voithians' hearts have been beating for the production and development of mobility solutions. Generations of Voithians have continued to face new challenges, by people and markets, and have played a decisive role in the development of the mobility industry.

2017





Birmingham is committed to reducing emissions – a mission fully supported by National Express West Midlands. The operator was one of the first to adopt Voith’s fuel-saving DIWA.6 Stop-Start Technology.

↓  
**40%**  
 of their time  
 buses spend in  
 idle mode.

Stop-Start technology automatically disengages the driveline and enables standstill times of up to 180 seconds.



A bus with DIWA.6 Stop-Start offers a smooth ride and benefits to the environment, drivers and passengers alike.

Britain’s second-most-populous city, Birmingham, will soon be enjoying better air due to a number of initiatives for a cleaner city, low-emission buses among them.

Birmingham-based bus operator National Express West Midlands (NXWM), a subsidiary of the National Express Group, runs 1,500 buses providing services in Birmingham, Walsall and Wolverhampton. The company is investing millions in drastically cleaning up what comes out of the exhausts of its buses. The company’s serious commitment is also evident in its participation in the West Midlands Combined Authority Low Emission Bus Delivery Plan. In 2016 transport operators and local authorities publicly pledged to put £150 million into working in partnership to increase numbers of passengers, keep customer satisfaction high and improve air quality. “We have a responsibility within the West Midlands to try to help with the emission issues,” says Colin Saward, Head of Engineering for National Express Bus. That initiatives like these are successful is confirmed by a 2016 Greener Journeys report, which shows that across the UK, a new generation of clean buses is already saving 55,000 metric tons of greenhouse gas emissions per year, and delivering £8 million in health and environmental benefits.

Partnering with Voith in 2015, NXWM operated two buses fitted with the newly developed Voith DIWA.6 Stop-Start Technology. “We saw this as an opportunity to work with another company to reduce emissions and to improve the air quality within Birmingham,” states Saward. During normal operating conditions – including at bus stops, at red traffic lights and in heavy traffic – city buses spend up to 40% of their time in idling mode, resulting in

# DIWA.6 Stop-Start

DIWA.6 Stop-Start Technology enables standstill times of up to **180 seconds.**

More than **1,000**

buses in the UK are already equipped with DIWA Stop-Start Technology.

**2,000**

buses worldwide are already equipped with the DIWA SmartNet Technology. With the DIWA.6 automatic transmission, online monitoring of the driveline is possible. This makes preventive maintenance possible, increases uptime and prevents unscheduled vehicle standstills. The DIWA SmartBox periodically transmits the data to an Internet server.

**10 – 12 percent**  
reduction in fuel consumption can be achieved.

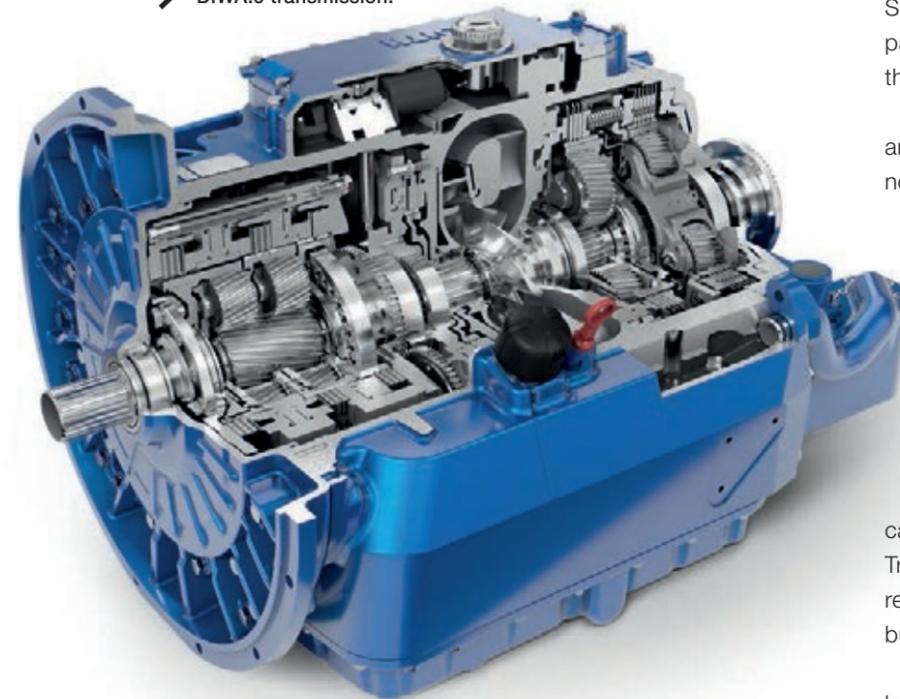
**“We have seen savings in the region of 10%.”**

Colin Seward,  
Head of Engineering with National Express Bus

**50%**

The proven DIWA power split principle allows stepless starting and braking across a speed range, where other transmissions require two to three gear shifts. Result: Up to 50% fewer gear shifts, higher driving comfort – and significantly lower wear in the driveline.

Only a software enhancement is required, with no need to modify the design of the DIWA.6 transmission.



unnecessary fuel consumption and pollution. The DIWA.6 Stop-Start Technology requires only a software enhancement, with no need to modify the design of existing DIWA.6 transmissions. The technology automatically disengages its driveline and enables standstill times of up to 180 seconds. There is no negative influence regarding startup readiness caused by the Voith gearbox in urban city applications. The result: an impressive savings in fuel consumption of 10% to 12%, depending on application, and, as a consequence, a reduction in emissions. During the testing phase of one year in real-life conditions, NXWM was able to directly observe the effectiveness of the system. “Because we were running the two trial vehicles alongside ordinary vehicles on the same routes, we were able to compare fuel efficiency back to back. We saw savings in the region of 10% in the two Stop-Start vehicles, which is really good,” explains Seward.

## Proof of concept

After testing Voith DIWA.6 Stop-Start for a year, NXWM is adding 96 vehicles with the technology to its fleet.



Next to the ecological impact, the fuel savings achieved through DIWA.6 Stop-Start also have an economic impact for bus operators, who can run their fleets more efficiently.

Passengers, drivers and pedestrians also profit, thanks to the reduced noise during stop times. “For myself and the passengers, the new Stop-Start Technology gives a much smoother ride. And for me as a driver, it is less stressful. At a stop, you just put the hand brake on, the engine shuts down and it all goes nice and quiet. You let the hand brake off and you know it will start. It is reliable, and you can just carry on,” says Andy Walcott, Driver Training Officer with National Express, recounting his experience in driving buses with DIWA.6 Stop-Start.

For National Express West Midlands, DIWA.6 Stop-Start Technology proved to be a complete success, which is why the company is expanding its fleet accordingly: “All 101 buses that we’re buying this year come with DIWA.6 gearboxes and conform with Euro 6. And 96 of those vehicles will have Stop-Start on them,” says Seward.

# A new location for quality products

Voith Turbo has a new Chinese headquarters. The production site is fully equipped to meet the needs of the Asia-Pacific markets.



\_\_\_\_\_ To better cater to the Chinese and Asia-Pacific markets, Voith Turbo has moved its headquarters in Shanghai to the newly built Lotus plant in the Minhang District. On an area spanning 80,000 square meters a broad range of products is manufactured. The portfolio includes couplings and gearboxes for metro, light-rail, regional and high-speed trains. For buses and trucks three different retarder types are produced – one of which has been specifically designed for the Chinese market. “Most of our products are still developed in Germany but locally adapted to the needs of the Asian markets,” explains Martin Wawra, Managing Director Voith Turbo China & CMO APAC Mobility. Which means, for example, that the materials used are readily available in the region. In this way Voith Turbo China keeps in close proximity to the value chain of its customers. “We are also in close exchange with our customers. If it becomes apparent that certain changes

are needed to fit their needs, we develop the necessary adaptation together with them locally,” says Wawra. All in keeping with the high quality standards Voith is known for all over the world.

**A high need for mobility solutions**  
With yearly growth rates of 7% China is an important market – especially for

**“Most products are still developed in Germany but locally adapted to the needs of the Asian markets.”**

**Martin Wawra**  
Managing Director Voith Turbo  
China & CMO APAC Mobility

the mobility sector. “The cities are still experiencing significant increases in population,” Wawra says. “In metropolises like Shanghai, up to 50,000 peo-



The new Lotus plant in the Minhang district in Shanghai.

ple inhabit a space of just one square kilometer in the inner city.” It is needless to say that it would be unthinkable to fit cars for everyone into the same space. “The only solution is good public transport infrastructures in the cities, which include buses, metro and light-rail as well as regional and high-speed trains,” says Wawra. “How to establish a truly efficient infrastructure is a much-discussed topic here. And we want to support our customers in finding the right solutions.” \_\_\_\_\_

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The future city concept study “Aequorea” designed by Vincent Callebaut Architectures, Paris.

## Q&A questions and answers

**What will cities and mobility solutions look like in a hundred years?**  
Trend researcher Christian Rauch from the Zukunftsinstitut (Future Institute) provides a glimpse into what may be.

\_\_\_\_\_ **How do you envision the city of the future?** They will be highly condensed – growing upwards with roof terraces and vertical farming plants. I also imagine that they will grow closer to the water again, maybe even into it. We are already seeing the beginnings of this in cities like Copenhagen, Oslo or New York. In general, cities will be able to make use of space quite differently, we will experience new public spaces through the disappearance of office space, simply because of the continuing structural change of the economy. There will also be a lot more traffic-calmed, pedestrian-friendly areas.

\_\_\_\_\_ **What about public and private transport?** Individual transport will still be important. But it will merge more and more with public transport. This will be a continuation of what is already happening with developments like car sharing. However, there will be an even greater variety of mobility

systems like shared electric scooters in the inner cities or microcarriers. There will be a shift from privately owned vehicles towards a very fluid, seamless mobility. Digitalization will be the enabler, so that different modes of transportation will be interconnected. It is feasible that buses, minibuses and microcarriers interlink for certain stretches, making traffic more efficient, and then separate to pick up or drop off people. I also think that drones as flying taxis will become a staple – not as a mass transport system but as a means to connect cities and their environs. And maybe there will even be hyperloops connecting the larger cities.

\_\_\_\_\_ **It has been estimated that four-fifths of the world population will live in cities in a hundred years. How will they all be supplied?** This is indeed one of the greatest challenges we face – how to supply the growing cities in a sustainable and climate-neutral manner. It is difficult because today's highly optimized supply chains are starting to become part of the problem rather than the solution. But new technologies for food production may solve part of this. If we will be able to produce substantial amounts via vertical farming or in-vitro meat, a lot of food transports could become superfluous, as locally produced products would be readily available. \_\_\_\_\_



Welcome  
to the Next  
150 Years

**VOITH**

Inspiring Technology  
for Generations