

THE MAGAZINE FOR POWER TRANSMISSION

# PERSPECTIVES

# 2 | 2011

LOS ANGELES – METROPOLIS OF SUPERLATIVES

## DREAMS IN XXXL

WIND ENERGY – TECHNOLOGY OF THE FUTURE  
CLOSE TO THE WIND

SHANGHAI – THE GROWTH ENGINE OF CHINA  
RISING HEAT IN THE FAR EAST

**Downtown LA:**  
Where the pulse is  
always a little bit higher.

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**Text, layout and graphics:**  
KircherBurkhardt Stuttgart GmbH

**Printing:**  
C. Maurer Druck und Verlag GmbH & Co. KG

**Photos:**  
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TECHNOLOGY FOR DEMANDING TASKS

# ACTIVELY INTO THE FUTURE

**The art of engineering** also means keeping a constant eye on developments. And never before has this been more exciting than today. The world is facing huge challenges, more and more people need more and more energy and efficient infrastructures. At the same time we should of course never lose sight of the natural limits to growth. Voith has always developed products that combine high performance with resource protection – as a contribution to the responsible creation of our future. In this first edition of PERSPECTIVES we would like to demonstrate this with a view of the US metropolis Los Angeles. Here, Voith products can be found in numerous applications, for example the San Diego Trolleys – the first trams in the USA – which are fitted with Scharfenberg couplers and Voith transmissions. We are pioneers in other fields, too. Together with Mercedes-Benz we have developed the world's first secondary water retarder for applications in heavy trucks and coaches. But our activities also extend to areas such as the Argentinian Andes. There, a wind turbine fitted with our Win-Drive generates electricity like in a power station.

As always, I hope you will enjoy the issue of PERSPECTIVES. Yours sincerely



**PETER EDELMANN**

Board Member of Voith GmbH, Chairman of  
the Board of Voith Turbo.





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EDITION  
2/2011

PERSPECTIVES  
The Magazine for Power Transmission



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PERSPECTIVES  
MULTIMEDIA

... AND THIS IS HOW IT WORKS:  
PERSPECTIVES now also provides multimedia content to be explored by little squares on certain pages – so-called QR codes. With a smartphone and the appropriate program, glossy photographs can now be turned into moving images. Follow the instructions and see for yourself. You need an iPhone (from 3GS) or a smartphone with the Android operating system. We recommend a cell phone with a camera from two megapixels.



- 1 Choose a suitable app (QR Reader) on your usual platform and download it onto your smartphone (there are free reader apps, for example i-nigma).
- 2 Open the application on your smartphone and move the camera directly over the QR code on the magazine page. Many cell phone cameras still lack certain macro functions. This is why the picture may not be sharp. In this case, scan the code from a distance, this often helps.
- 3 Once the QR code has been recognized, your smartphone opens the connection to the relevant multimedia content. You can now get started! Please note: You should have a flat rate, otherwise videos might be very expensive.

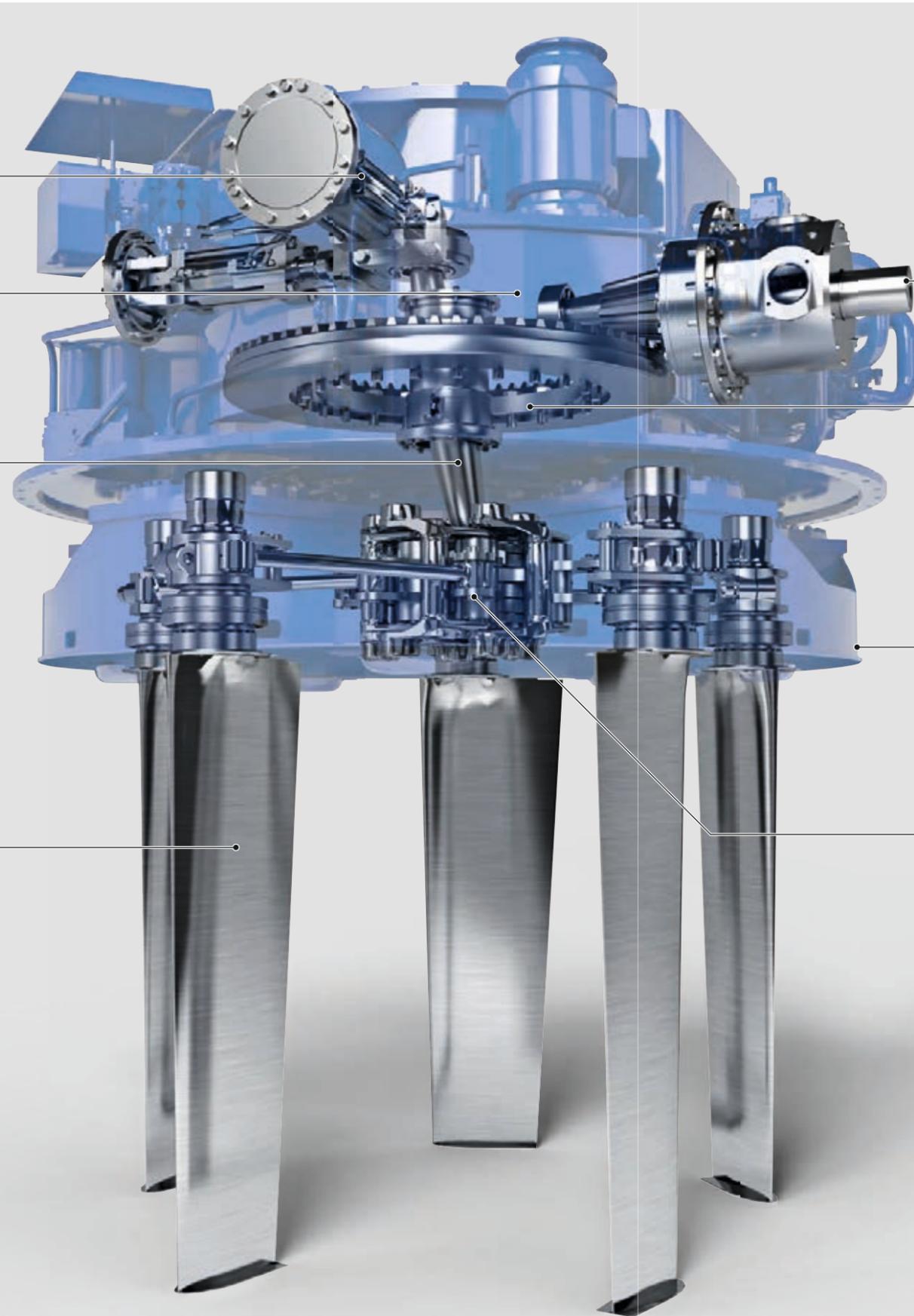


## NORTH SEA GIANT

# POWERFUL AND AGILE

**161 meters long** and 30 meters wide – the North Sea Giant is the largest vessel in her class worldwide. But this is not the only reason why she is such a looker in any harbor. When she arrives in the port, she always creates some kind of modern techno drama. The North Sea Giant is powered by six motors, generating a combined output of nearly 21 000 hp. The vessel was built in 2010 for laying underwater cables, as a drillship or as a support vessel for underwater robots. The operating area of this juggernaut is the North Sea, in seafaring circles regarded as one of the roughest waters in the world. In order to keep the ship maneuverable and stable even in the most confined spaces, the North Sea Giant has five Voith Schneider Propellers – a record. Never before has a single ship been fitted with so many VSPs. The owner praises the “extremely fast maneuvering response” of the mighty water worker. This refers to the ultra-prompt reaction of the vessel when the control rod is moved on the bridge. Additionally, the Voith Roll Stabilization (VRS) makes sure that the vessel does not sway too much. ▶

Turning on the spot: Thanks to VSP no problem, even for the colossal North Sea Giant.



**Hydraulic cylinder**  
Generates a specific force in sailing direction or cross-ways to the ship. Activation via stand on the bridge.

**Propeller housing**  
Transmits the propeller forces into the ship and takes up the bevel gear, the hydraulic cylinders and the control rod.

**Control rod**  
Works like a joystick and ensures adjustments of the Voith Schneider Propeller. The captain moves the control rod via remote control through the hydraulic cylinders.

**Propeller blade**  
Key element of the Voith Schneider Propeller. The blades generate the propeller forces.

**Input shaft**  
Transmits the energy of the main engine to the Voith Schneider Propeller.

**Bevel gear**  
Transfers the energy of the drive motor from a horizontal to a vertical level. Additionally used for speed reduction.

**Rotor casing**  
Contains the propeller blades and the kinematic gearbox.

**Kinematic gear**  
Ensures that the blades oscillate from side to side, creating the thrust of the Voith Schneider Propeller.

**The North Sea Giant** is the largest vessel ever fitted with Voith Schneider Propellers. Voith was involved already during the development stage of the leviathan. Numerical calculations of the flow dynamics were followed by model tests at the Vienna ship model basin. The innovative drive concept was tested on a nine-meter model ship. The seagoing capacities were examined both in calm waters and during heavy seas. Result: The concept with the five largest Voith Schneider Propellers works – the North Sea Giant is a massive success. //



**And "Action":**  
Scan this code and see how the Voith Schneider Propeller makes large vessels maneuverable and flexible. For further instructions, see page 5.

[http://www.voithturbo.com/applications/qr/North\\_Sea\\_Giant/](http://www.voithturbo.com/applications/qr/North_Sea_Giant/)

**DR. DIRK JÜRGENS**

The 49-year-old is a Voith Schneider Propeller expert and explains the key elements of this Voith product on the basis of the graph on the left. He is head of the Research and Development Division of Voith Turbo Schneider Propulsion GmbH & Co. Prior to that, he obtained a doctorate with a thesis on the Voith Schneider Propeller in 1993 and then worked at Blohm and Voss shipyard until 1999.



CITY LIFE

# DREAMS IN XXXL

Los Angeles, one of the world's largest metropolitan regions, works like a hybrid drive. California's dream factory gets its everyday renewable energy by living in hope.

TEXT: ELMAR BRÜMMER

And there was light:  
Los Angeles as  
a luminous carpet.



Entangled and twisted: Welcome to the freeway jungle.



Into the whole world:  
Los Angeles Harbor is one of  
the largest ports in the world.

Anybody who wants to see Los Angeles blush has to get up early and walk down to the Santa Monica Pier. Coming from the mountains, a delicate pink hue floods the entire cityscape. As far as the Pacific. It looks as if it is going to be one of those days when it is all too understandable why people want to go to LA. They come to learn how to dream.

The only thing is that many of them don't know exactly what they wish for. But even before the evening bathes the plain in a golden light, a few things might have come true that seemed like a dream in the morning. Yes, it is quite easy to see Los Angeles as a dream factory. It is simply a matter of opinion what shines more brightly – the limelight or the Californian sun. And the famous Hollywood sign gleams vaguely in the distance.

Away from the pier, the visitor quickly realizes that people in Los Angeles think on a different scale. During the rush hour, the "American Way of Drive" is grueling. And the 500 miles of freeway which entangle – some people even say engulf – the center do not make any difference. What looked like a fascinating, glittering carpet during the landing approach, its glowing grid for ever burnt in our photographic memory, now turns out to be a concrete needle eye. The Angelenos spend an average of 100 hours per year in traffic jams, whatever the expansion efforts of the transport planners. The price to pay for the slogan "Go West" that still attracts the masses long after the gold rush.

In LA, whose full name is Los Barbara Diego San Santa Angeles, thinking takes place in

different dimensions. Everything is huge here. Wide-screen format, XXXL. Just perfect for the really big dreams – and everyday disasters. Like 15 million others, the journalist Larry Dietz has learned to deal with it: "A few years ago, we had banners across the roads of our district: Prepare for Disaster! Of course, we have forest fires, floods, earthquakes and horrendous traffic. But last spring I drove through Los Angeles to a restaurant where they serve incredibly good Mexican food. I could hardly move on the freeway, but I saw on the horizon that the mountain peaks were still covered in snow. This made me once again aware that I live in one of the world's most wonderful parts. And as far as the traffic is concerned: Well, even paradise wasn't perfect."

Elevated to a technical level, it can be said that Los Angeles is an urban hybrid, which gets its energy from a constantly renewable hope. Seemingly unstoppable and unlimited. Optimism might well be a subject at the famous university UCLA. Nowhere else in the United States is everyday life so full of expectations. And those who do not find their dream can at least be sure to have tried. The many fractions in the city are shaped from millions of immigration stories. And this also applies to the general euphoria.

What better place for the movie industry than to settle here. The relaxed atmosphere of the Pacific beaches and the hustle and bustle downtown blend into a professional phantasy that is mirrored by the street names. Sunset Strip. Rodeo Drive. Santa Monica Boulevard. A patchwork of fame and vanity. ▶

And then stark contrasts. The trip up into the mountains only takes half an hour. Topanga Canyon. This is where the coyotes howl. A region where you can feel like James Dean. Lush vegetation makes you forget the concrete and the metal of the plains. We continue on to Mulholland Drive, which surrounds the sizzling plains of LA like a cauldron.

No wonder that this is where one can find the most exclusive houses with the most exciting architecture. Eccentricity is in the nature of this city, which is in a permanent state between gala and gaga. "La-La-Land", this is what the Americans call this cosmos. There comes a point when one is simply overwhelmed by this scenery.

It is indeed difficult to decide where the movie ends and reality starts. Or vice versa. The same goes for the settings. After endless films and television series, some tourists seem to be more familiar with the surroundings than with their own hometown. But the next surprise is just around the corner. LA is like a lucky bag, and this not only applies to the mile of narcissism along Venice Beach. Even the famous "Hotel California" is real and not just a song

title by the Eagles. In fact, there are several Hotel Californias. Can it be that life is just one long movie? Our heads start to spin, it must be the thrill of Hollywood.

And the next question is: Who is actually in charge here? Does the city control the people or is it the other way round? Let's put it this way: It varies from day to day and from district to district. What this eternal conflict definitely generates is a lust for life. The giant city manages in no time to make you feel very small. At the same time, it also makes it all too easy to feel big. LA is more trendy, fitter, lighter, richer, more wicked, colorful and diverse than several other states bundled together.

And it is also less ignorant and superficial as prejudice has it. The world's exhaust legislation is largely based on the strict regulations issued in Los Angeles as early as the mid-seventies. Mobility has always been the magic word at this spot on the west coast. Even in the pioneering days in the 1920s, there was one car per seven residents – at the time the highest vehicle density in the world. This might be due to the frugal early days: No harbor, no ▶



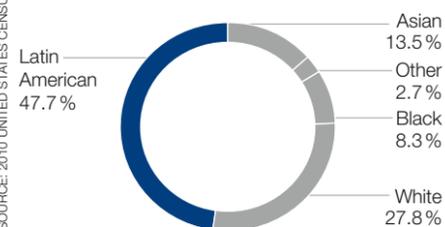
A sunny sport – and quiet, too. Baseball in the Dodger Stadium.

PHOTO: KURZ/LAF

**Facts on Los Angeles:**

Inhabitants	3.79 million (world ranking 48)
Area	1.3 million km <sup>2</sup> (world ranking 7)
Population density	3 154.1 residents per km <sup>2</sup>
Foundation	4 September 1781
Average annual temperature	19 degrees Celsius
Days of rain per year	27

**Composition of the population**

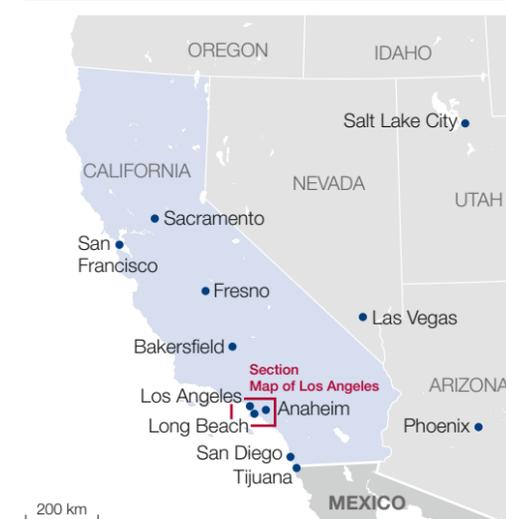


**Largest Metropolitan Areas in the USA\***

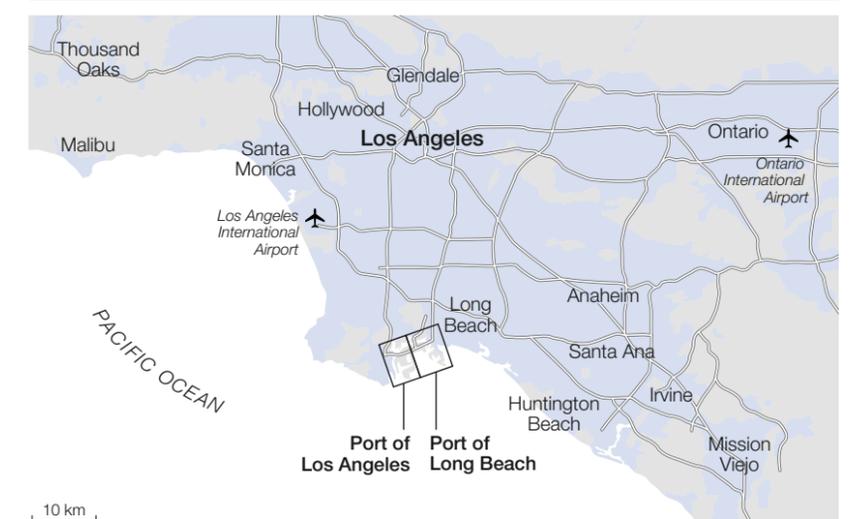


\*By residents.

**The US State of California**



**The Conurbation of Los Angeles**



railway, hardly any drinking water. Catching up with this pent-up demand has turned into an obsession.

Today, Interstate 405 is the most frequented motorway in the world. The aorta in this road network holds the entire region in thrall. When a section of the San Diego Freeway, which runs parallel to the coast, had to be closed for two days due to bridge construction works, many of the otherwise undaunted and defiant inhabitants really feared that the world was coming to an end.

Freeway, what a promise! As long as people take the “free” not too literally. There are warning voices, like Jean-François Lyotard, the founder of postmodernism, who compares LA to a chessboard “whose diagonals are 40 miles long and lead to nowhere.” Pardon, Monsieur – but the to and fro only adds to the depth of the many features and facets of Los Angeles. Industrial areas and dream beaches alternate at a speed as if somebody has pressed the fast-forward button. A kaleidoscope of urbanity. Fleeting encounters, lasting impressions. And always this slight tendency towards drama.

It is a well-known fact that metropolitan areas have problems in abundance. This also applies to Los Angeles. Greater LA is the place that lives through all developments, and under the burning lens of the Californian sun, these developments seem to get even bigger. On its website, the respected Los Angeles Times quite openly shows a “Homicide Map”, where people can search for crimes in the neigh-

borhood by entering their zip code. And then we can read in “Frommers”, America’s traveling bible, that Los Angeles is the most entertaining city in the world. Indeed, not many people know that LA has the world’s highest density of museums compared to its total population.

Local analysts state that their city is “psychologically very challenging.” With a rather strange problem. Hardly anybody who lives here admits openly that he likes the city. Apparently, musicians like Frank Sinatra (“LA is my lady”) or Randy Newman (“I love LA”) have never been asked. But if New York is the heart of the world, Los Angeles is the pacemaker.

Sorry, dear New Yorkers, the sunsets in the west are simply unbeatable. In the evening, back at the pier, we can witness a red-hot demonstration of the origins of the city’s nickname: The Big Orange.

Illuminated by a giant soft-focus filter, many sins can be forgiven, and transfiguration can take its course. This is the point where the famous Route 66 ends. And suddenly, even banal motorcades look like blazing streams of lava. Or, to stay with the historic comparison, like gold veins. California, the big promise.

And sometimes, it is just enough when, among the many dreams that are nurtured in Los Angeles, at least that of a clear blue sky comes true. This city is simply beyond comprehension. //



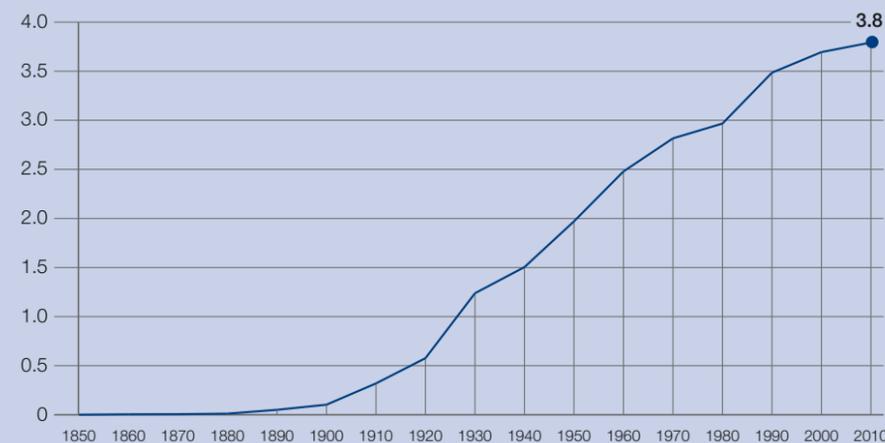
Beneath palm trees:  
Venice Beach is one of  
the city’s landmarks.

PHOTO: HEMIS/LAIF

## INTERESTING FACTS

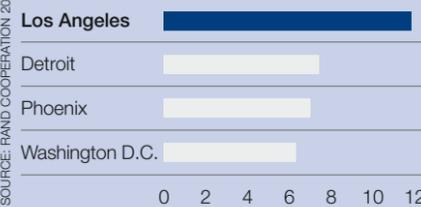
### Population Statistics Los Angeles

Population development since 1850 in million per residents



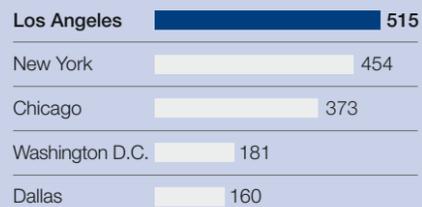
### US cities by road miles ...

In miles per square mile of metropolitan area



### ... and by traffic jams

Delays in thousand hours per year



### Living dangerously at the San Andreas fault: the earthquake regions California and Mexico



The San Andreas fault runs in parallel to the US west coast and separates the Pacific and the North American plates, which keep scraping against each other. The detached section of the North American plate moves north-west with the Pacific plate and is regarded as an integral part of it. The probability of a serious earthquake in Southern California until 2032 is currently at 99.7 percent. And there are further danger zones. Several tectonic rifts run right below Los Angeles, for example the Hollywood rift beneath Sunset Boulevard.

### Voith in North America

# 18

Locations are operated by the Voith Group in the USA and Canada. Voith Turbo is represented in six cities: In York (headquarters), Sacramento, Cincinnati, Houston, Calgary and Mississauga.

# 1913

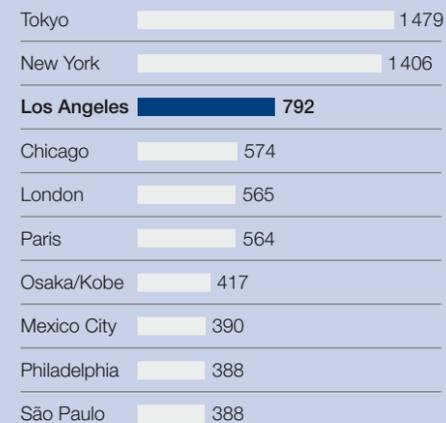
Is the foundation year of J. M. Voith Company Inc., the first Voith subsidiary in North America. Voith Turbo has been active in the USA since 1975. But the first orders date back much longer. In 1903, twelve Francis turbines, each rated at 12000 hp, were ordered for the Niagara power plants.

# 5 157

People worked for the Voith Group in North America in fiscal year 2009/2010. In total, they achieved sales amounting to EUR 719 million during this period. This corresponds to 14 percent of the Group's worldwide sales.

### Conurbations with the World's Largest Gross Domestic Product

2008, in billion US-dollars\*



\*By purchasing power parity.

INTERVIEW

# CLEAR MISSION

High-end products made in Germany, satisfied customers and big opportunities in the huge US market: Normand Boisvert, President and CEO of Voith Turbo Inc., is set to vigorously expand the company's presence in North America.

### What is the reputation of German products in the United States?

They are regarded as reliable, long-lasting and safe. It is taken for granted that they are fitted with modern technology and carefully engineered down to the tiniest detail. People are also aware that German products usually feature in the premium price segment. But the value of the products and the service make the purchase worthwhile.

### Can you name a few concrete examples from the Voith Turbo product catalogue?

Nearly all products fall under this category – from our variable-speed planetary gear Vorecon and our DIWA automatic transmissions to the Voith Schneider Propeller. And there are also new products like the crash energy management system for passenger trains.

### Does it matter to your customers that Voith is a German company?

Yes it does. Customers have great faith in products from Germany or Europe. But they also appreciate local service – a successful combination.

### Which products are particularly popular?

Many of our products are well received in the

market. Perfect examples would be our variable-speed couplings and our high-speed and high-performance drives. They are in demand by the oil and gas market and also by the power station industry. Additionally, we have so far installed 12000 automatic transmissions in transit buses.

### What are the goals of Voith Turbo in North America?

Voith Turbo has a relatively small presence in the huge North American market. As a result, our opportunities are virtually unlimited. The mission is clear. Over the next five years we want to grow by 100 percent. The key for this expansion is finding the right employees with excellent qualifications. Voith products are often used in interesting places or specialty vehicles.

### Have you ever visited any of these applications?

Yes, I have been in coal mines stretching across miles underground and on ferries that take hundreds of thousands of passengers from shore to shore every week. My next visit will probably take me to a wind park where I can admire the WinDrive. Seeing our products in real-life operation and talking to customers is highly rewarding! //



**NORMAND BOISVERT**

The 60-year-old has been CEO of Voith Turbo Inc. since 2007 and is responsible for the US market.

SAFETY IN THE HARBOR OF LOS ANGELES

# WATER ON

The LA Fireboats are the most impressive fireboats in the USA. The jet of the strongest fire monitor has a reach of up to 200 meters. But despite their power the boats are maneuverable and as nimble as ballerinas – thanks to the Voith Schneider Propeller.

When Captain Derek LeDuff starts the engines, even the veteran fishermen at the pier drop their work and watch how LA Fireboat 2 departs. Witnessing how the ship moves sideways from the fire station in Los Angeles Harbor is always a spectacle, even for old salts. Just like that, as if it is the most normal thing in the world for a ship to sail strictly sideways and not a meter forwards. Well, not really, what is used here is a Voith Schneider Propeller (VSP).

The workplaces of this firefighter are the landing bridges of Los Angeles. Together with the harbor of Long Beach, the area is regarded as the gateway to Asia and the largest industrial port on the US west coast. Every day, dozens of huge oil tankers and container vessels are anchoring here. Luckily, Derek DeLuff has never experienced really seri-

ous accidents like the fire of the fully laden oil tanker “Markay” in June 1947 or the explosion of the oil-carrying “Sansinea” in December 1976, but he and his ship would certainly be prepared for the event.

Training exercises are held every week: LeDuff takes the ship into the outer harbor. Slight vibrations of the deck planks signal that the giant pumps of the most powerful fireboat in the USA have started to work. Seconds later, the necessary pressure has been established. The first officer gradually opens the valves of the ten fire monitors on the 32-meter ship. Shortly afterwards, LA Fireboat 2 looks like the center of a fantastic water park.

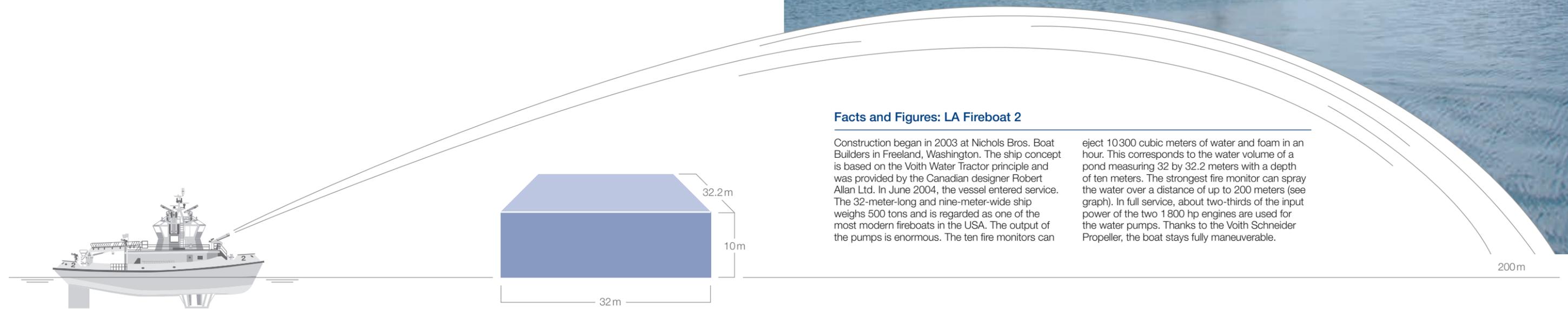
The jet of the strongest fire monitor at the bow has a reach of nearly 200 meters,

enough to clean the windows of Munich’s Olympic Tower from the ground. At full load, the bow fire monitor emits 1 070 liters of water in one second. If things get serious, the pumps can mete out 10 300 cubic meters of water and foam per hour through the ten fire monitors. This corresponds to the contents of seven normal 50-meter swimming pools with a continuous depth of two meters.

Sometimes, LeDuff directs the bow fire monitor to the Vincent Thomas Bridge and sprays a high arc of water over the road. The nearly two-kilometer-long bridge connects two sections of Los Angeles Harbor, and the driveway is situated at a height of 120 meters. “But we only do it when there is not much traffic”, says the captain with a smile. ▶



Emergency training exercise: LA Fireboat 2 during a firefighting drill outside Los Angeles Harbor.



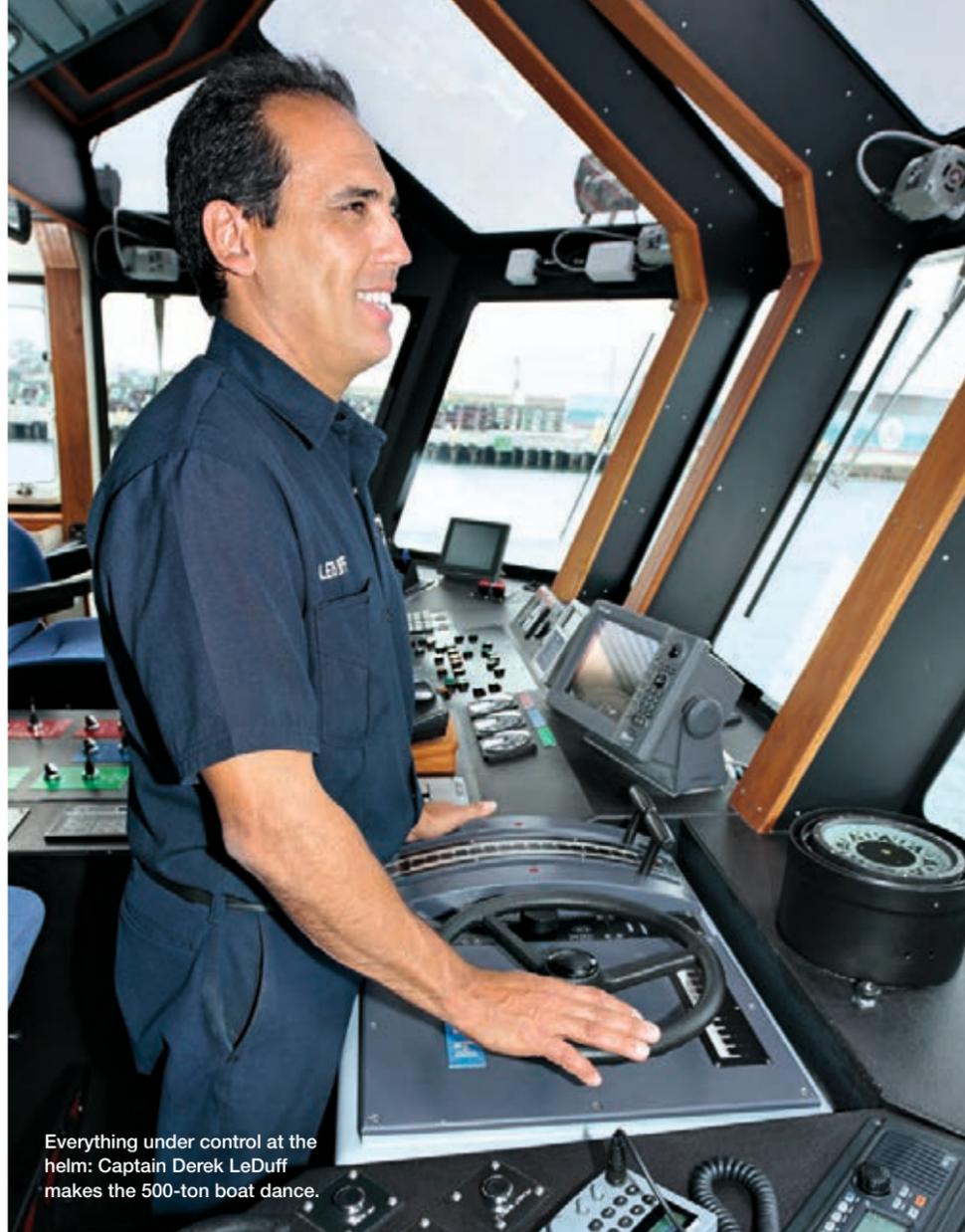
### Facts and Figures: LA Fireboat 2

Construction began in 2003 at Nichols Bros. Boat Builders in Freeland, Washington. The ship concept is based on the Voith Water Tractor principle and was provided by the Canadian designer Robert Allan Ltd. In June 2004, the vessel entered service. The 32-meter-long and nine-meter-wide ship weighs 500 tons and is regarded as one of the most modern fireboats in the USA. The output of the pumps is enormous. The ten fire monitors can

eject 10 300 cubic meters of water and foam in an hour. This corresponds to the water volume of a pond measuring 32 by 32.2 meters with a depth of ten meters. The strongest fire monitor can spray the water over a distance of up to 200 meters (see graph). In full service, about two-thirds of the input power of the two 1 800 hp engines are used for the water pumps. Thanks to the Voith Schneider Propeller, the boat stays fully maneuverable.

The deck is covered in white spray, while the canons spit water at full power. But now LA Fireboat 2 shows its true potential. The boat turns pirouettes and performs precise maneuvers. This is possible because of the Voith Schneider Propellers and the world-wide unique concept of the Voith Water Tractor. It allows up to 70 percent of the 3 600 hp output of the two main engines can be utilized for the fire pumps, while the ship stays fully maneuverable at an engine output of just 30 percent – thanks to the advantages of the Voith Schneider Propellers. “In an emergency, this is extremely important”, explains Derek LeDuff, “especially if seas are heavy and winds are rough.”

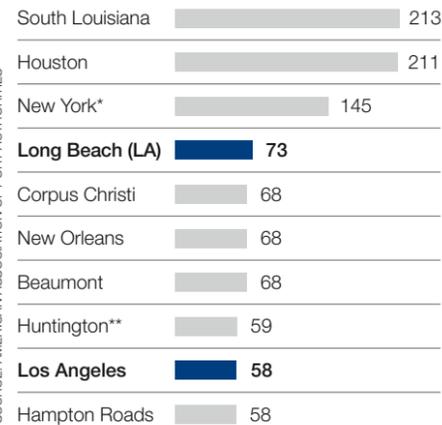
The pumps are silent now and the captain is happy. He turns off and sails back into the harbor. Nobody wants an emergency, but in such an event, the team around Derek LeDuff would be prepared. “There is simply no better solution than the Voith Schneider Propeller”, he says. While conventional boats have the same fire pump output, they move like clumsy teddy bears. Derek LeDuff: “But thanks to the Voith Schneider Propeller, my ship dances like a graceful ballerina.” //



Everything under control at the helm: Captain Derek LeDuff makes the 500-ton boat dance.

**The Largest Harbor in the USA**

Total throughput in 2009 in million tons



\*With New Jersey. \*\* Huntington Tristate.

**Little Brother**

Children have always been fascinated by the battle with fire. Firefighters are heroes, and their job, so the little ones imagine, is full of adventure. The designers of the Lego Fireboat (Picture: Lego) have obviously used the big version from Los Angeles as a role model, even if the little brother has only six instead of ten water canons. The Lego version is able to float, but it does not have a VSP under its belly.



SAN DIEGO TROLLEYS

# ELECTRIC CARRIAGE

30 years ago, San Diego launched the first tram in the USA after the Second World War – with technology from Voith.

It can get really hot in Southern California. Travelling in an air-conditioned tram is therefore a total treat. This is perhaps one of the reasons why the San Diego Trolleys are so popular.

But the history of public transport in San Diego dates back long before the invention of air conditioning – a solid 125 years. On 3 July 1886, the first open horse-drawn carriage drove through the city with an impressive 32 passengers on board. At a speed of eight miles per hour, the cart operated between Fifth Avenue and D Street – now called Broadway. These early beginnings with stables, mules and a rather erratic timetable have meanwhile evolved into a modern company, which – apart from numerous bus routes – also runs three tram lines: Today’s San Diego Trolleys. 30 years ago, in July 1886, the first tram line from the historic old town stretching along the Pacific south coast to a few meters before

the Mexican border, was opened. For one dollar, passengers could travel in the bright-red trams on the nearly 26-kilometer-long route. 14 trams made in Germany operated on the line from five o’clock in the morning until nine o’clock in the evening. Today, the tram network comprises three lines covering 86 kilometers and is probably the city’s most important transport system. Be it a trip to the Fashion Valley shopping center, to Qualcomm Football Stadium or even to the Mexican border – the trolley system takes you there. And Voith Scharfenberg couplers make sure that the individual carriages are safely connected. Additionally, Voith transmissions guarantee reliable power transmission.

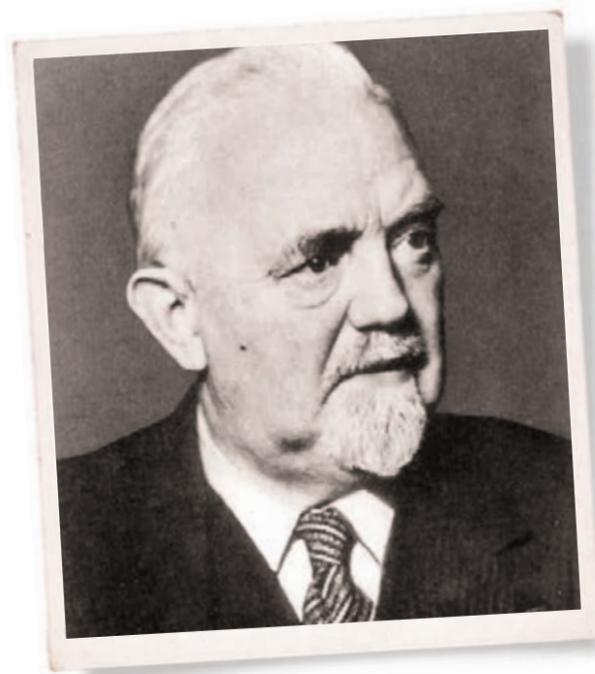
The expansion of the trolley system goes on; new routes are being planned. And the trams also offer excellent value for money: Over the last 30 years, the price of a single ticket has risen by only 25 cents. //

**The Network of the San Diego Trolleys**



Reliable for more than three decades: The San Diego Trolleys.

PHOTO: METROPOLITAN TRANSIT SYSTEM



SCHARFENBERG COUPLERS

# A SECURE CONNECTION

An inventor from Wismar, Germany, has revolutionized railway technology. In 1904, Karl Scharfenberg patented a system for connecting train carriages safely and rigidly, without presenting a risk to railway workers. Today, the Scharfenberg coupler is still in use, with its principle more or less unchanged – for example in the ICE.

**It really was dangerous work.** Until the beginning of the last century, the railway coupler crew still had to climb between the carriages in order to mount the screw couplers manually. An undertaking that cost the lives of many workers when the carriages unintentionally started to move – which happened quite frequently. As early as 1873, the “Verein Deutscher Eisenbahnverwaltungen” (Association of German Railway Administrations) launched a competition. The aim: Development of a coupling that works “without the worker mounting the coupling having to step between the carriages.”

Yet it took until 18 March 1904, before the “Imperial Patent Office” published the invention of Karl Wilhelm Heinrich Friedrich Scharfenberg under number 149 727. The engineer from Königsberg in East Prussia had developed a coupler system where the locks of the two couplers connected automatically when the two carriages faced each

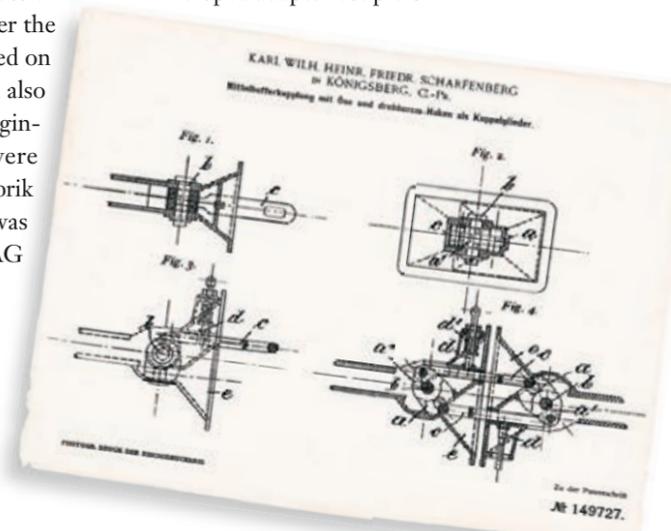
other. Nobody had to climb between the carriages any more, the connection – once established – withstood both pressure and tension. As far as its mechanical locking principle is concerned, the Scharfenberg coupler is still unchanged. The coupler has, of course, undergone systematic development and can now couple trains mechanically, electrically and pneumatically.

Scharfenberg, who was born in Wismar, Germany, on 3 March 1874, initially had to fight for the success of his new idea, until it finally began to win over the industry in 1909. He had developed the coupler as an engineer of the East Prussian Südbahn in Königsberg. After the success of his patent he moved on to Waggon-Fabrik Steinfurt, also in Königsberg, as a senior engineer. Initially the couplers were manufactured by Waggon-Fabrik Steinfurt, until production was transferred to Scharfenberg AG

in Berlin, where the inventor was one of the co-founders. Scharfenberg died on 5 January 1938 at the age of 64 during a business trip to Gotha, shortly after receiving a major order.

In 1957, Scharfenberg AG, which had moved to Salzgitter after the war, became part of the Salzgitter Group. In 2002, Voith acquired the company, which now trades under the name Voith Turbo Scharfenberg GmbH & Co. KG. The company currently delivers complete front ends for high-speed trains, for example to China, as well as fiber-compound rail vehicle heads and newly developed adapter couplers. //

Contemporary witness:  
The original patent of the Scharfenberg coupler from 1904.



# VOITH TURBO WORLDWIDE



- Heidenheim headquarters
- Production
- Sales, service

INDUSTRY

- 28 THE BIG RIP**  
Car shredders have to cope with massive loads. Voith technology provides reliable drivelines.
- 29 SLOW ACCELERATION**  
For the first time, the Voith geared variable-speed coupling is used in combination with a combustion engine.

MARINE

- 30 CALM IN THE STORM**  
The brand new Polar King stays on course even in rough seas thanks to Voith Schneider Propellers.
- 31 VSP BREAKS THE ICE**  
Side effect of a technology: Voith Schneider Propellers clear the ice in navigation channels in winter.

RAIL

- 32 PERFECTLY COMBINED**  
Voith increases crash safety for high-speed trains.
- 34 TRAVELLING SAFELY**  
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- 34 SNOW-PROOF**  
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ROAD

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- 37 ALWAYS THE RIGHT GEAR**  
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- 38 TAKING A DEEP BREATH**  
Two- and three-cylinder compressors close to series application.
- 38 MOTOR-DUO**  
DIWAhybrid saves diesel in buses.



Highly flexible coupling



SafeSet coupling



Universal joint shaft



Turbo coupling

COMPLETE DRIVELINE SOLUTIONS FROM ONE SINGLE SOURCE

# THE BIG TEAR

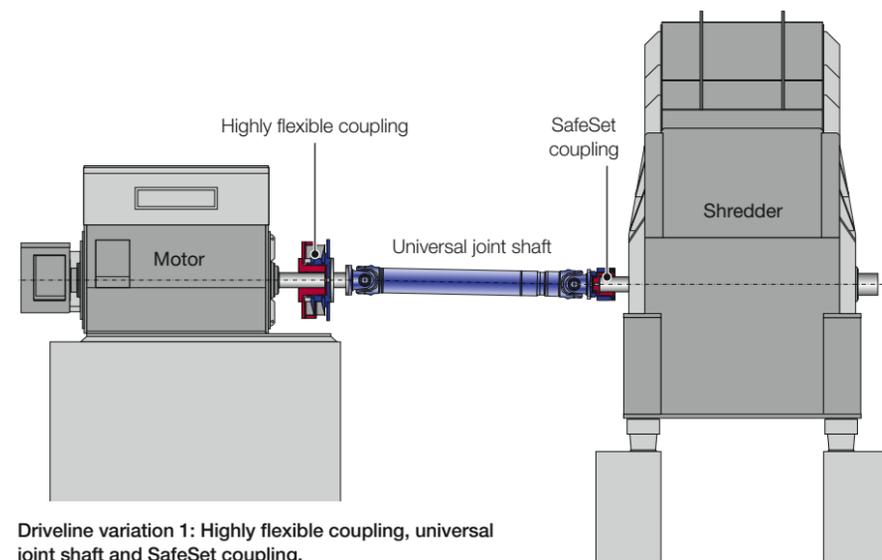
Engineering, products, diagnosis and service from Voith make shredder plants even more reliable and robust.

**Technology never ceases to amaze:** With deafening noise, automotive shredders end the life of our old cars. Within minutes, they shred the scrapped vehicles chunks similar into golf balls. All materials are then separated. Most of the material is then recycled and used as a primary feed source for new material. In everyday operation, the drives of these huge shredder plants are exposed to the most arduous of operational hazards, that have to be overcome, to ensure maximum reliability. If a shredder is out of service, the owner cannot earn money. The hazards are indeed manifold – overloads, vibrations and peak torques make huge demands on the drive.

Voith offers shredder manufacturers and operators complete solutions. “We provide tailor-made driveline optimizations with couplings and universal joint shafts from our range and

can thus offer individual solutions from one single source,” says Paul Barlow, Engineering & Sales Manager at Voith Turbo in the USA.

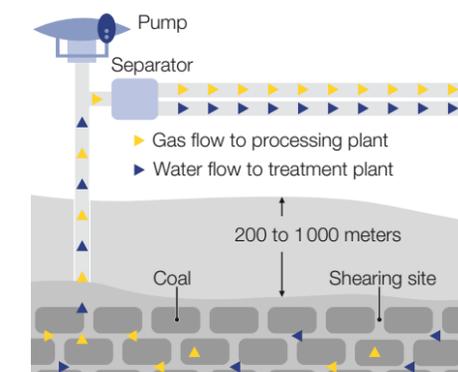
For new shredder systems, Voith engineers initially calculate all anticipated loads on the driveline. At existing shredders, Voith service technicians measure real-time torques and vibrations. These diagnostic details help to identify possible weaknesses in the driveline. “After evaluating all the data we get together with the customer and select the components from our products that are optimally suited to the driving machine and the shredder,” explains Paul Barlow. For operators, this means that their plants will run more reliably and efficiently with less downtime periods. “We are taking on what is known as ‘system responsibility’ for the complete driveline between the driving machine and the shredder,” claims the expert. //



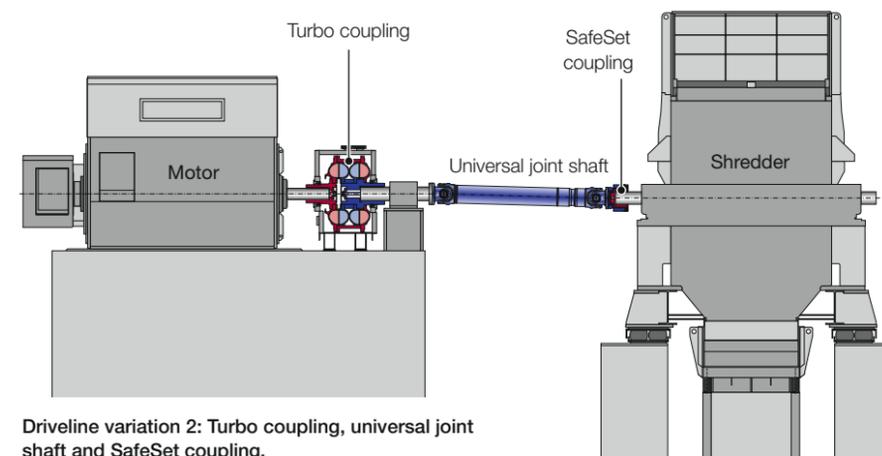
Imposing technology with Voith driveline: Car shredders in the USA.



## SLOWLY STEPPING ON THE GAS IN DOWN UNDER



**Voith geared** variable-speed couplings have been operating reliably for decades in the world’s power stations as well as in oil and gas plants. Driven by electric motors, Voith components control the speed of pumps and compressors. In Queensland, Australia, coal-seam gas is being extracted in the form of methane. The gas is moved to the surface through drill holes. In order to extract it, the coal seam is dewatered by pumps. The water is contaminated and is to be cleaned for further use. Therefore three Voith geared variable-speed couplings are meanwhile in service in an Australian water-processing plant. They are an integral part of vapor gas compressors. The robustness of the Voith technology combined with the principle of hydrodynamic power transmission and the possibility of load-free motor start-ups when the drive trains are started give enough reasons for applying geared variable-speed couplings into this new application. A special feature: The Voith geared variable-speed coupling is used in combination with a combustion engine – ideal for areas without sufficiently strong electric grids. //



## CALM IN THE STORM

In March 2011 the Polar King was launched at Freire Shipyard in Vigo, Spain. The ship from Technocean was specifically designed for building underwater constructions, for example in offshore wind parks. Despite a length of 110 meters and a weight of 5 700 tons, the Polar King can be maneuvered precisely even if seas are rough. This agility is ensured by two Voith Schneider Propellers (VSP) and the integrated Voith Roll Stabilization (VRS). The ship chartered by the Norwegian owner GC Rieber Shipping offers room for 112 people and has been developed specifically for service in rough weather on the North Sea and other challenging waters, for example in southern Argentina. The Polar King is a true workhorse. Each of the six engines has an output of nearly 2 700 hp, the crane at the stern can lift 150 tons and is thus ideal for the construction of wind plants. A similar vessel – the Polar Queen – is currently under construction. //



**PRODUCT**  
Voith Schneider Propeller

**APPLICATION**  
Offshore vessel

**TECHNICAL FEATURES**  
Stepless thrust generation, simultaneous variation of input and control forces, generation of identical thrust over 360 degrees by a vertical axis, two servomotors per propeller allow control by x/y coordinates.



At home in the rough seas: The Polar King defies wind and waves.

PHOTO: COURTESY OF C.N.P. FREIRE, SPAIN

NO FEAR OF COLD WEATHER

## POINT OF BREAKAGE

Voith Schneider Propellers are not only good for the maneuverability of ships. Another advantage: They hurl ice floes away and ensure free passages.



Little big ship: Bugsier 16.

### The physical results of the Aker Arctic laboratory.

1. Point of impact: Propeller blades are usually situated at the upper part near the bearings. This results in a low bending moment. The amount of bending moment has a significant influence on the service life of the propeller blades.

2. The collision with the ice floes takes place at the front edge of the blades. At this load, the resistance moment of the blade profile is at its highest, which minimizes the risk of damage.

3. The ice floes are forced to the side and do not get caught in the Voith Schneider Propeller. This means that they are hurled away immediately after the first contact.

4. With a view to point 3 it makes sense to choose units rotating to the outside, if two Voith Schneider propellers are installed. This is always the case with Voith Water Tractors (VWT). The advantage of the tractor concept lies in the deep-situated propellers, which are less likely to be obstructed by ice.

When the navigation channel in Rosstock harbor freezes over in winter, Siegfried Kempe is in his element. The captain of the 29-meter-long tugboat Bugsier 16 breaks the ice on the Baltic Sea and has “never had a negative experience.” On the contrary: Many people are amazed by what Bugsier 16 can do. In Gothenburg, for example, Kempe managed to free a grounded ship enclosed by ice in no time. “The Swedish colleagues were almost speechless that such a small tug can be so powerful in the ice”, says Siegfried Kempe.

But of course his skills alone are not enough. The successes of Bugsier 16 are also due to the performance of the Voith Schneider

Propellers (VSP). The renowned Finnish ice laboratory Aker Arctic has tested the VSP in wintry conditions and thus created a much better understanding of the physics of VSP drives in icy waters.

The main finding was that ice floes are immediately hurled aside after contact with the propeller. This means that the propeller itself is always free. “Jet propellers are quickly clogged up”, explains Captain Kempe, who also likes to utilize the other advantages of the VSP: Excellent maneuverability, robust technology and steplessly variable propeller thrust and wash. “Not even driftwood can harm the Voith Schneider Propeller”, claims the seaman, “it just tosses it away”. //

TECHNICAL CHALLENGES OF HIGH-SPEED TRAINS

# PERFECTLY COMBINED

In many countries, high-speed trains have become a genuine alternative to car, plane & co. With a wide range of Voith technology, they are not just fast, but also reliable – all over the world. To ensure this, Voith combines front noses and Scharfenberg couplers into individual safety concepts.

In many countries, high-speed trains are the most endorsed transport technology concept for the future. On routes below 500 kilometers, these trains, operating at speeds of up to 400 kilometers per hour, are meanwhile more than just an alternative to flying. In Europe, the elegant supertrains can be found mainly in Spain, Germany and Italy; worldwide, China and Japan are the key backers of this new technology. Spain intends to expand its high-speed network to approximately 5 600 kilometers by 2025 – a threefold increase compared to the current line availability.

For many years, Voith has been supplying important components, covering aspects such as couplers, safety and energy efficiency, for the slim supertrains used in more and more countries. Voith final drives, automatic and

semiautomatic Scharfenberg couplers, semi-permanent couplers and front noses, SafeSet couplings and cooling systems are in service worldwide. For the V 300 Zefiro projected in Italy, Voith will deliver 800 final drives, 100 front noses and automatic couplers, as well as 350 semipermanent couplers for 50 trains over the next few years.

The accident in Wenzhou, China, in July this year has highlighted that safety must be a central issue of all technologies. Voith is able to offer individual safety concepts, since key components such as front noses and couplers are fully adapted to each other. The goal: Total compensation of a possible accident with crash elements. Voith components make a vital contribution to meeting the DIN EN 15227 norm. With anticlimbing systems,

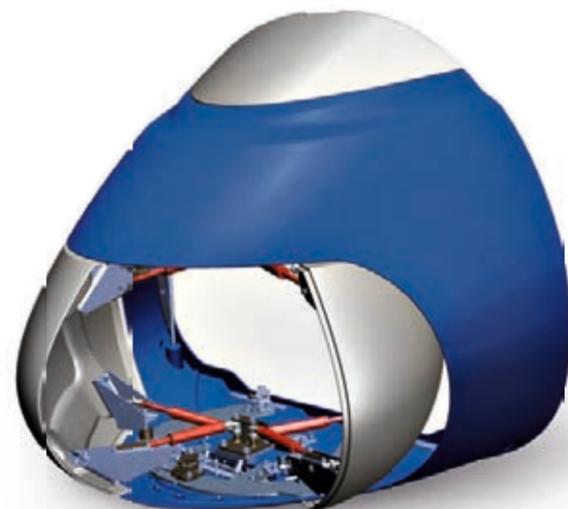
they also prevent the individual carriages from overriding in the event of an accident. Shock-absorbing elements inside the front nose help to take up even more impact energy. The self-supporting fiber-compound front ends therefore not only reduce energy consumption, they are also a vital contribution to train safety.

Voith not only provides individual safety concepts for its customers, it also benefits from the fact that the Type 10 Scharfenberg coupler is a fixed constituent of the TSI specifications – a standard requirement for high-speed trains. The TSI regulations aim at ensuring technical interoperability on the European high-speed network. Type 10 couplers are, for example, used in the German ICE, the French TGV and the Spanish AVE. //

PRODUCT  
Front nose

APPLICATION  
High-speed trains

TECHNICAL FEATURES  
Self-supporting fiber-compound construction, designed for speeds over 400 km/h, weight: 325 kg, supplied as fully pre-assembled module with final varnish.



## Voith Products in High-Speed Trains



PRODUCT  
Final drive

TECHNICAL FEATURES  
Designed for speeds of up to 580 km/h, speed trials on test stand: 700 km/h, ratio: 1.8, input power: 700 kW, Aluminium housing.



PRODUCT  
Automatic Scharfenberg coupler

TECHNICAL FEATURES  
Automatic Scharfenberg coupler Type 10 with 200 mm telescope and collapsible tube.



PRODUCT  
Scharfenberg semipermanent coupler

TECHNICAL FEATURES  
Scharfenberg semipermanent coupler Type 10 with gas-hydraulic buffer with 62 mm lift and steel spring.



PRODUCT  
Cooling system

TECHNICAL FEATURES  
The system has a cooling output of 300 kW. System weight: 830 kg.

Fit for the future: The CIT 400 high-speed train in China.



## TRAVELLING SAFELY

Voith is delivering crash buffers to Siemens for a total of 200 new sleeper cars, starting in autumn 2011. The modern carriages of Russian Railways (RZD) will be used in cross-border service between Russia and Western Europe. The sleeper cars are designed for locomotive-driven trains. Thanks to their European TSI (Technical Specifications for Interoperability) approval, they can in future operate throughout Europe. All wagons can be fitted with either a draw hook and a screw coupler, or with an SA3 central buffer coupler, which is typical for the Russian market. These units allow cross-border operation of the trains.

In driving operation, the crash buffer from Voith Turbo Scharfenberg has a reversible stroke of 110 millimeters. With 175 kilojoules, the irreversible energy consumption of the buffer ensures particularly safe travelling in the new sleeper cars. From September 2011, Voith will deliver both left and right crash buffers. The carriages are built in the Siemens plant in Vienna and in the rail vehicle building works of Tverskoy Vagonostroitelny Zavod AG (TVZ) north-west of Moscow. //



PRODUCT  
Crash buffer

APPLICATION  
Russian Railways

### TECHNICAL FEATURES

Length: 650 mm, reversible stroke: 110 mm, weight: 160 kg, irreversible energy consumption: 175.5 kJ at 130 mm stroke, mean force level 1 350 kN.



Part of the traction system:  
The Voith traction inverter.

### NEW TRAMS IN HELSINKI

# ABSOLUTELY SNOW-PROOF

Voith supplies the entire traction equipment to Finland – from pantograph to wheel.

**Everybody talks about the weather.** We don't. This might soon also be the motto of the tram drivers in Helsinki. The reason: Special features in the new trams, which will be delivered from 2013, make the vehicles winter-proof. They prevent, for example, snow or ice accumulating near the roof equipment. With a view to the very snowy and long winters in Helsinki, this is an important improvement.

As a partner of Transtech, Voith delivers the entire traction equipment for the 40 new trams in Helsinki – from contact wire down to the wheel. The package comprises all drive-line components, ranging from high-voltage equipment to motor-gear units, axles and wheels to the vehicle control system with a diagnosis unit. Everything from one single source and optimally adapted.

The drive consists of two double inverters and eight motor-gear units. Each inverter

supplies two motor-gear units. Should one drive (one inverter and two motor-gear units) fail, the system ensures that operation can be continued without any restrictions. The fully sprung, externally fitted motor-gear unit also allows low tram floors and high travelling comfort. At the heart of the drive system is the Voith Turbo-developed EmCon DI 1000-5AR double inverter with a continuous output of 2 x 180 kilowatts. The peak capacity of 400 kilowatts is also achieved – an absolute must for efficient tram operation.

Combined with the highly dynamic antislip control, the all-axle drive system provides optimum traction, whatever the operating conditions. During rolling phases the low-loss operation of the drive is able to feed braking energy back into the net. If the electric network is no longer able to take up this energy, it is used for heating the tram carriages via a thermal storage system – not a bad idea in hard Finnish winters. //



From 2014 monorails will also run in São Paulo (Brazil).

## SAVING SPACE

**São Paulo has** an ambitious goal: In time for the kick-off of the Football World Cup in 2014, the city's trains are to move up to 40 000 people per hour. This plan will become reality with the new monorails fitted with lightweight designed cooling systems and crash energy management systems from Voith. The Voith installation consists of automatic front couplers, semi-permanent couplers and crash energy management anti-climbers with fully adapted energy absorption capacities. Thanks to the space-saving design of the elevated monorail track, the usually driverless automatic trains are often a solution for crowded cities. In São Paulo (Brazil) and in the drawing board-conceived King Abdullah Financial District (Saudi Arabia) monorails are meant to take up service from 2014. But Voith can do even more as far as monorails are concerned. On the new 20-kilometer route in Mumbai (India), there are 15 monorails operating with vehicle head modules from Voith Turbo Scharfenberg. //



PRODUCT  
Vehicle head

APPLICATION  
Monorail Mumbai

### TECHNICAL FEATURES

24 V DC supply voltage, pneumatic kinematics, equipment includes a 24-lamp unit and electric windscreen wipers with 24 V.

## THE NEW MAN

On September 1, 2011, Ingolf Cedra took over as Executive Vice President of Voith Turbo Scharfenberg. The 40-year-old studied process technology at Dresden and Helsinki Technical Universities and gained an MBA degree at Augsburg University. In 1997 he joined Voith Paper in Heidenheim, where he worked in senior functions in areas such as process technology and development as well as projecting. From 2008 until 2011 he was in charge of the Products and Services Division at Voith Paper Automation.

Ingolf Cedra is married and has a son and two daughters. He loves to spend his spare time with his family and friends, and he is also an enthusiastic endurance sportsman. //

Ingolf Cedra is the new Executive Vice President of Voith Turbo Scharfenberg.



THE WORLD'S FIRST SECONDARY WATER RETARDER

# IT DOES NOT ALWAYS HAVE TO BE OIL

The system used in the Mercedes-Benz Actros saves 35 kilograms – for example by the absence of a heat exchanger.

**PRODUCT**

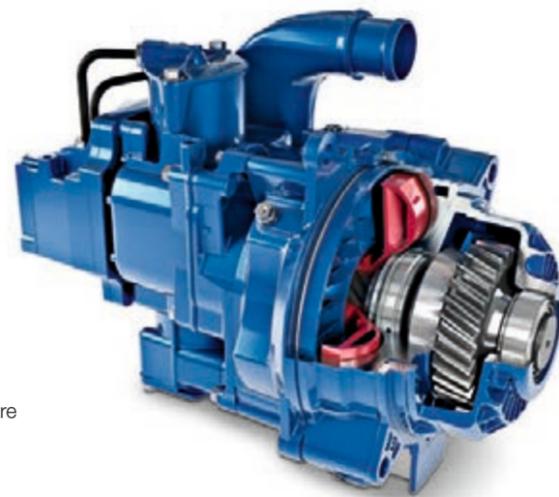
Water retarder

**APPLICATION**

Heavy trucks and coaches

**TECHNICAL FEATURES**

The cooling water of the engine is used as the operating medium – oil changes are not required. Brake dust emissions are reduced by up to 80 percent.



**Why add a separate** operating medium to a truck braking system, if the existing one can be used just as well? This was one of the questions behind a world innovation in retarder technology presented by Voith Turbo in the new Mercedes-Benz long-distance truck Actros. We are talking about the world's first secondary water retarder.

Unlike conventional retarders, the Voith water retarder does not operate with oil but with the cooling fluid of the engine. The advantages of the newly developed

product: Thanks to a significantly more compact design and the omission of the normally required oil-water heat exchanger, nearly 35 kilograms of weight can be saved. And what's more, the maintenance-free retarder is also more eco-friendly, as it is simply operated by cooling water. Voith has therefore once again set a new standard. Initially, 35 kilograms do not sound like a big deal for a mighty long-distance truck. But: Every kilogram of saved weight means more payload. And payload is a decisive factor for most hauliers when it comes to the

economical operation of their vehicles. 35 kilograms that at least partly compensate for the additional weight of the soon-to-arrive Euro-6-regulations.

Voith has developed the world innovation Secondary "Water Retarder" in close cooperation with Mercedes-Benz. With the latest model change to the new Actros, which already meets the exhaust limits of the Euro 6 regulations applicable from 2014, Voith will roll out series production of the new retarder in autumn 2011. //



**World Premiere:** Watch the function of the secondary water retarder developed in cooperation with Mercedes-Benz. For further instructions, please see page 5.

[http://www.voithturbo.com/applications/qr/SWR\\_Retarder/](http://www.voithturbo.com/applications/qr/SWR_Retarder/)



PHOTO: MERCEDES-BENZ



PHOTO: MERCEDES-BENZ

Always the optimum gear: SensoTop adapts all gear-shifting points to topography and vehicle dynamics.

## SAVING FUEL

In city buses, the topography-dependent gear-shifting program SensoTop makes a vital contribution to eco-friendly vehicle operation. All gear-shifting points are automatically and optimally adapted to the prevailing load condition, the acceleration and the topography. Using an inclination sensor and by evaluating the vehicle dynamics, the transmission control recognizes instantly whether a bus is running on a level route at full load, or driving uphill only partially loaded. SensoTop has already proven itself in numerous applications. In topographically demanding areas such as in Brescia, Italy, fuel consumption was reduced by seven percent. And on flat topographies like in Munich, SensoTop has made it possible to save two percent of fuel. //

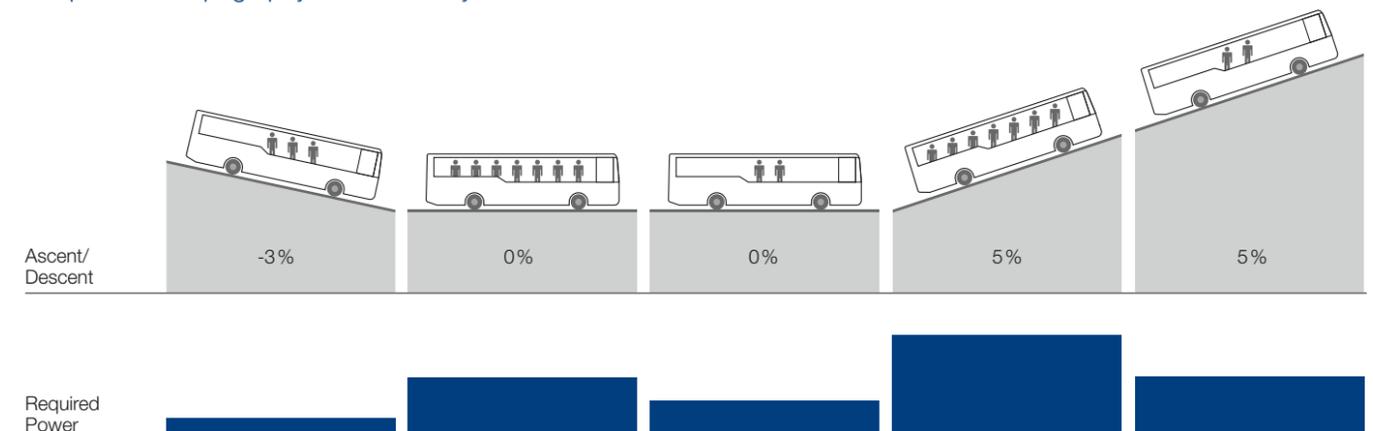


**Ideal gear-shifts:** Scan the code with your mobile phone camera and watch how effectively SensoTop works on any topography. For further instructions, please see page 5.

<http://www.voithturbo.com/applications/qr/sensotop/>

### Optimum fuel consumption with SensoTop

Adaptation to topography and vehicle dynamics





## TAKING A DEEP BREATH

**Public transport in Istanbul** is hectic and demanding. Huge buses with 200 seats fight their way through the busy city at 30-second intervals and need one thing above all: Lots of air. No problem with Voith products. Since 2008, buses at the Bosphorus drive reliably with the three-cylinder LP 700 air compressor – and have already covered more than 250 000 kilometers. A generation of two- and three-cylinder compressors has now entered series production. The units are built in lightweight design (aluminium castings). Pilot customers in Europe and South America have already confirmed the positive characteristics. Voith air compressors save up to 1.8 liters of diesel per 100 kilometers. In braking and coasting operation, energy can be recuperated. Therefore: Take a deep breath. //

**PRODUCT**  
Air compressors

**APPLICATION**  
Trucks and coaches

**TECHNICAL FEATURES**  
High energy efficiency, high air quality and high pressure levels.

## TWO MOTORS IN ONE BUS

**Driving electrically** means saving diesel – and protecting the environment. This is why Bochum-Gelsenkirchener Straßenbahnen AG (BOGESTRA) is currently performing field tests with the new Solaris Urbino 18 DIWAhybrid. BOGESTRA has eleven such vehicles in its fleet and is the first operator in Germany with a 100 per cent hybrid bus line. The articulated bus with parallel hybrid drive has two motors. With the DIWAhybrid an electric motor rated at 150 kW supports the diesel unit during start-ups and acceleration. During braking, the electric motor serves as a generator and functions like a primary retarder, supporting the DIWA secondary retarder. Energy generated during braking is stored on high-performance condensers (Supercaps) installed on the roof of the bus. Additionally, the service brake is protected, which reduces brake wear and fine dust emissions. Passengers enjoy the same amount of space as in a conventional bus: the hybrid system increases the weight of the bus by only about 600 kilograms. //

**PRODUCT**  
DIWAhybrid

**APPLICATION**  
City buses

**TECHNICAL FEATURES**  
Parallel hybrid system, basic transmission: DIWA.5, electric motor with 150 kW, Voith inverter, Supercaps as storage medium.



POWER GENERATION OF THE FUTURE

# CLOSE TO THE WIND

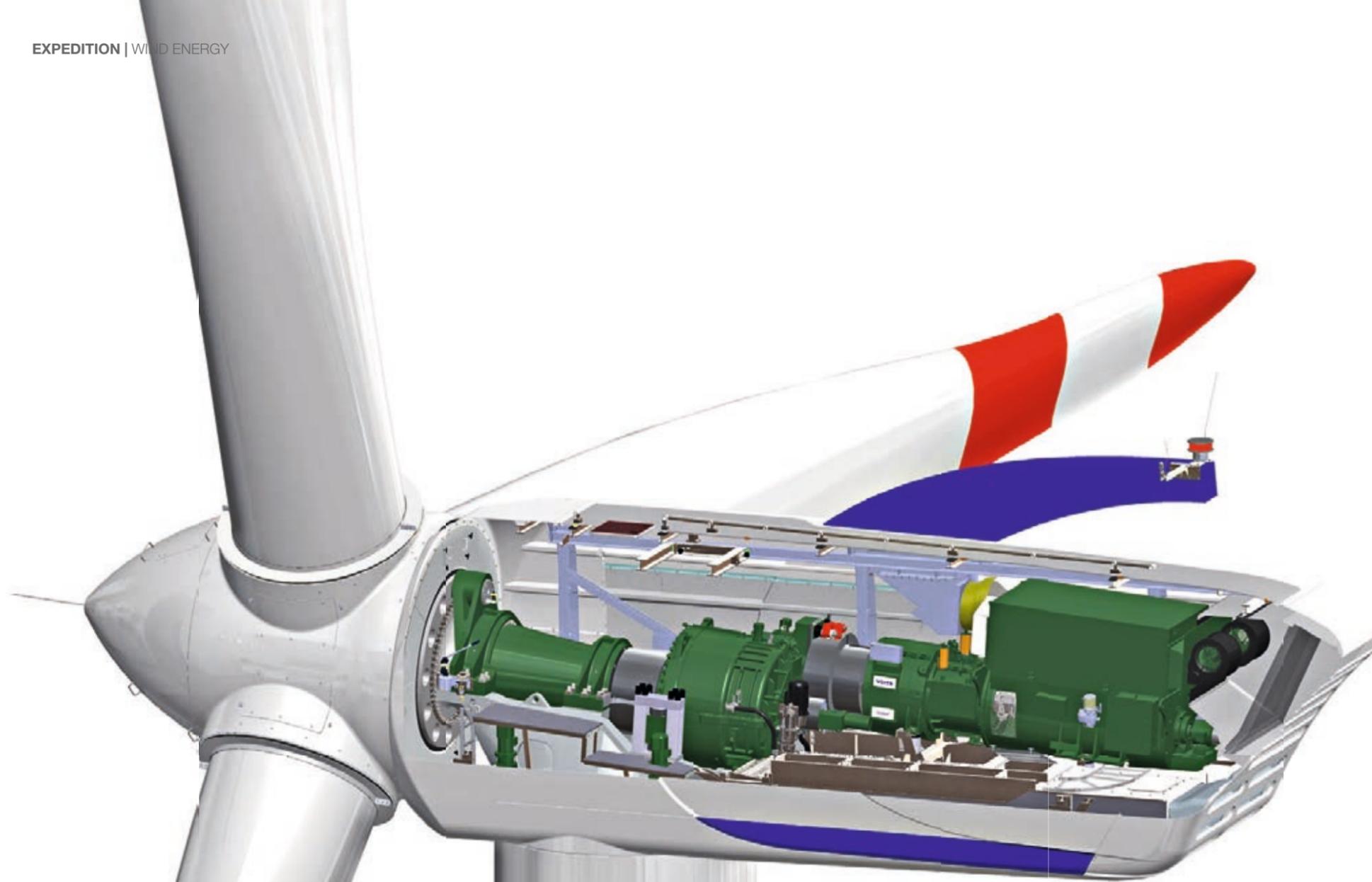
Fossil energy is a finite resource, and nuclear power is hotly debated. Wind, on the other hand, is free and nonpolluting and therefore plays an increasingly important role as a means of power generation. With Voith technology, wind turbines can produce electricity like a traditional power station.

TEXT: JÜRGEN LÖHLE

**Voith technology at an altitude of 4 200 meters: The wind power station for the electric energy of the Argentinian Veladero gold mine.**

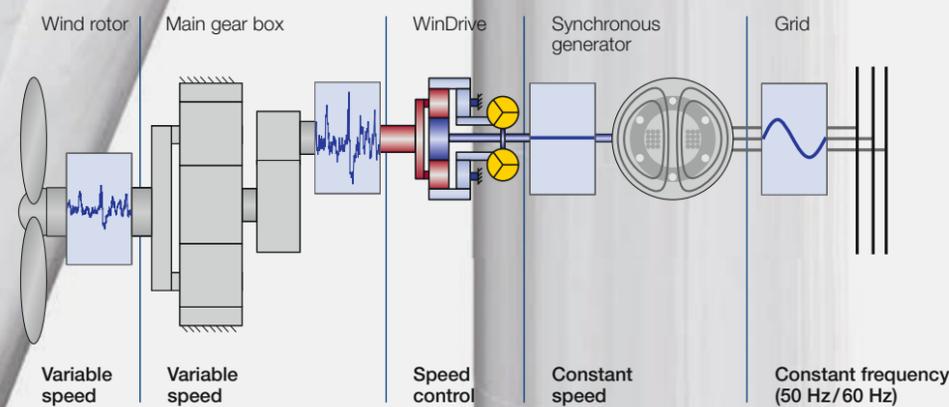


80 meters up in the air, wind guaranteed – the view over Cuxhaven, but only for those with a head for heights.



Cutaway model: The driveline of a wind turbine with Voith WinDrive – a transmission with hydrodynamic control.

**Design of the Driveline**



**Not a nice day in Cuxhaven.** The sky is a solid gray, the outlook is bleak. Uwe Reimesch doesn't mind, after all he did not travel to the North Sea for his summer holiday. The Sales Manager of Voith Turbo Wind GmbH & Co. KG in Crailsheim inspects the prototype of the DeWind D8.2 plant – a small adventure in itself, even for a mechanical engineer whose job revolves around wind power. The steel tower is 80 meters high, and whoever wants to go up into the gondola (official term: nacelle) has to climb a ladder inside the tower, step by step. Of course securely belted up and wearing a helmet. Safety comes first. The full height is not instantly recognizable because the tower is divided into four segments, but 20 meters is already rather daunting. A head for heights is definitely required. And scaling 80 meters is also quite exhausting.

Once arrived at the top, Reimesch enters the gondola and declares that it "feels a bit like being in a camper." And then he ventures outside through a narrow hatch. For a brief moment he stands on the roof of the gondola at a dizzy height right behind the huge rotor. But it is only after he has returned inside that he feels the true force of the wind on the North Sea coast. When the rotor is unlocked, catches the wind and slowly begins to turn, the steel tower bends backwards. And the gondola with the driveline and the generator starts to vibrate like a ferry at the moment of take-off.

This is how wind power can be felt directly – more and more. In the first half of 2011 alone, 356 wind farms with a total output of approximately 793 megawatts were newly installed in Germany. Wind is a free alternative energy source and also has another

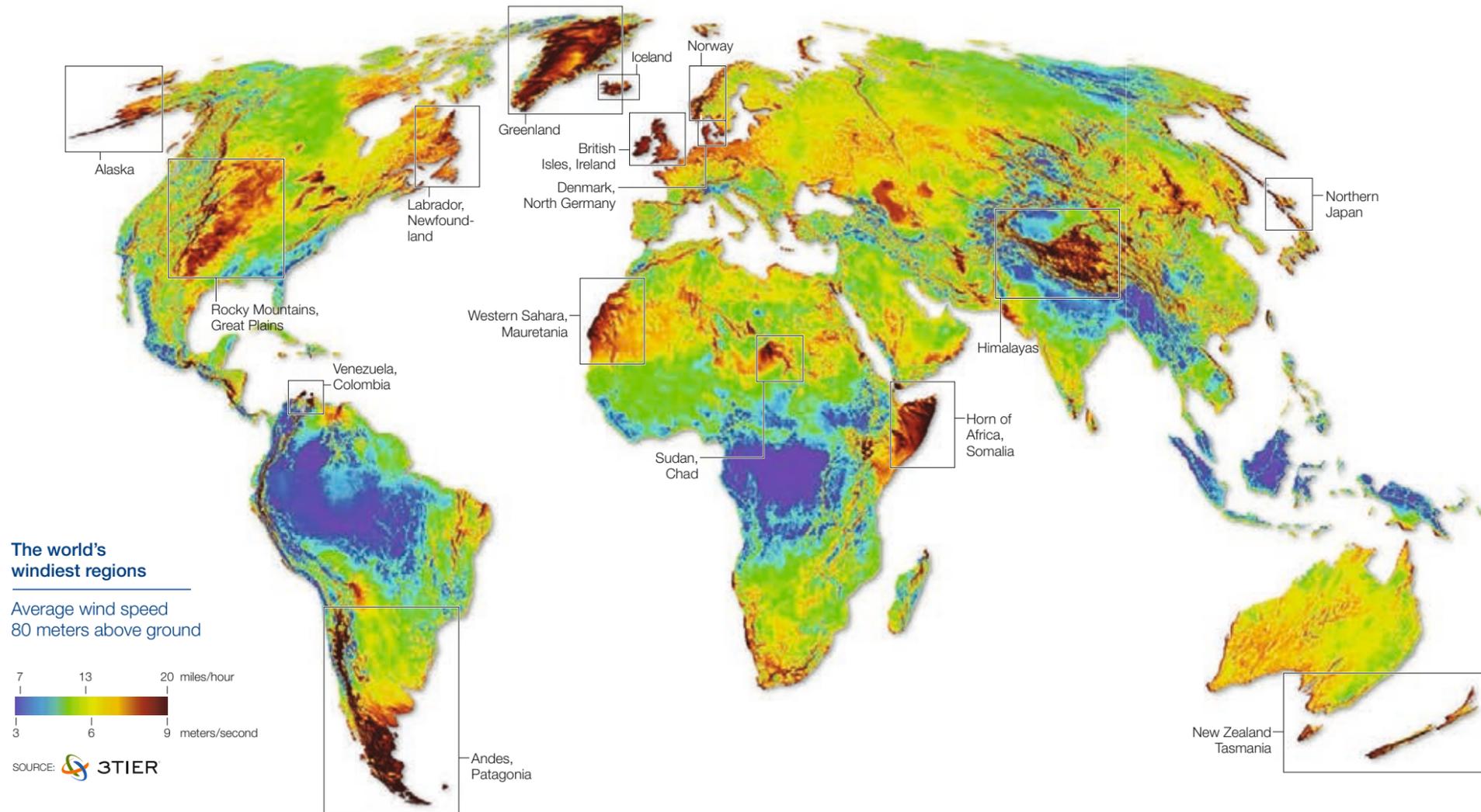
important advantage. According to Uwe Reimesch, a wind power plant produces more than 20 times the energy expended for its construction during its anticipated service life of two decades. A figure, to which other alternative energy technologies, for example photovoltaics, don't even come close. Wind energy is therefore a technology of the future, which promises immense opportunities. Nearly all energy forecasts are confident that wind power will have the highest growth rates. By the middle of 2011, nearly 22 000 wind parks were in operation in Germany.

Since inland wind turbines often operate at remote and inaccessible spots, low-maintenance, robust and failure-resistant drivelines are an important component of these plants. During his on-site inspection, Uwe Reimesch is therefore pleased to see that the Voith WinDrive in the DeWind plant in Cuxhaven has continued to do its job since 2007 without problems or interruptions. The plant generates an output of two megawatts when it runs at optimum range. This corresponds to the energy consumption of more than 1 000 households.

The Voith WinDrive is an intelligent concept. It converts the variable speed of the wind rotor into a constant speed for the synchronous generator. The WinDrive is installed between the main transmission and the grid-coupled synchronous generator. This type of generator produces electricity with power station quality at a constant 50 or 60 Hertz. Wind farms with WinDrive technology can therefore operate without failure-prone frequency inverters. The heart of the WinDrive is a hydrodynamic torque converter with a ▶

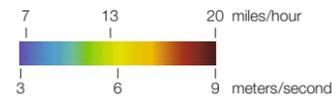
**TECHNOLOGY OF THE FUTURE**

Nearly all energy forecasts are confident that wind power will have the highest growth rates.



**The world's windiest regions**

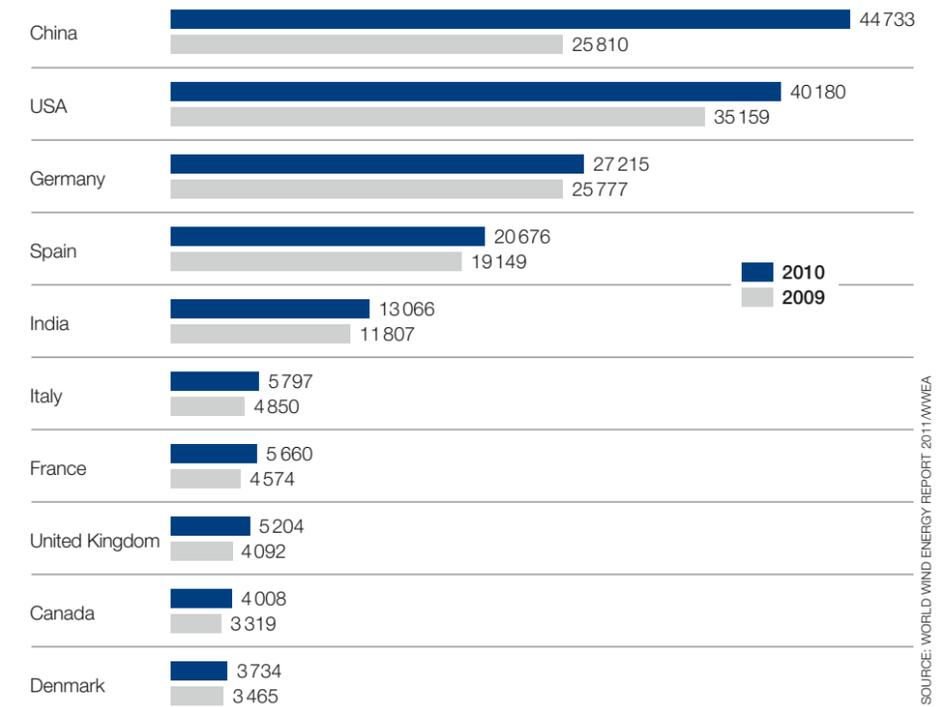
Average wind speed 80 meters above ground



SOURCE: 3TIER

**The ten nations with the highest wind energy capacity**

By total capacity in megawatt in 2010 and 2009



SOURCE: WORLD WIND ENERGY REPORT 2011/WWEA

planetary gear designed as a superimposing gear. The WinDrive allows the utilization of simple and robust generators, feeding the produced electricity straight into the grid at high quality. “One could also say that we produce electricity like a traditional power station,” says Reimesch.

The WinDrive weighs about five tons and is currently installed in 16 wind farms all over the world. Alongside Cuxhaven, the WinDrive can also be found in a wind turbine which supplies power for the Argentinian Veladero gold mine. Situated at an altitude of 4200 meters in the Andes, the world’s highest wind power plant has been generating electricity reliably for the machines in the mine since 2008, despite extremely rough ambient conditions.

In the USA, ten DeWind wind turbines, each rated at two megawatts, operate near the Texan city of Hutchinson in the Little Pringle wind farm. The most recent project with Voith technology is currently under way in China. “We have meanwhile begun to produce the WinDrive in series,” explains Uwe Reimesch. The production output capacity of Crailsheim presently amounts to 400 WinDrives per year – capacity expansions are already planned.

For operators of onshore and offshore wind energy plants, the WinDrive has benefits that are not offered by any other technology. Reimesch highlights four points that make the WinDrive unique apart from its speed adaptation properties. Number one is of course the reliability of the system.

This is followed by the fact that plants with WinDrive work practically like traditional power stations, which means that they can get directly into the grid via a synchronous generator. Another plus is the protection of all drive components by the dampening properties of the torque converter in the WinDrive. The robust construction, which withstands environmental influences is another major strength.

In the Andes for example, temperatures fluctuate between minus 25 degrees Celsius at night and plus 15 degrees Celsius during the day. When the sun shines in summer, the temperature in the gondola can easily reach plus 40 degrees Celsius after an ice-cold night. None of this is a notable problem for the WinDrive. “Our machine with its

oil-filled torque converter is a closed unit and virtually insensitive to heat or cold,” explains Reimesch. “The WinDrive doesn’t mind at which height it operates or in which climatic zone the turbine is situated.” In fact, without additional arrangements, conventional wind turbines with frequency inverters would not work at all in low atmospheric pressures and the extreme weather at such altitudes.

Even sandstorms – a frequent occurrence at the latest location in China – have no adverse

effect on the WinDrive. Yet heat, cold, and dust are factors that often lead to failures in plants with frequency inverters. “Power electronics are not happy in extreme heat or cold,” says Uwe Reimesch.

And he is actually quite tough, too. He really enjoyed the long ascent in the tower of Cuxhaven. And he also liked his excursion into the open air at a height of 80 meters – despite the blustery wind and the rather unpleasant weather. //

**ON DUTY, WHATEVER THE WEATHER**

Heat, cold or dust do not affect the WinDrive. The unit robustly defies environmental influences.



**UWE REIMESCH**  
Sales Manager of Voith Turbo Wind GmbH & Co. KG.



Sometimes boat, sometimes platform: These jack-up vessels for installing wind parks are currently under construction at a Dubai shipyard – with Voith Schneider Propellers.



OFFSHORE

# STRONG BOYS

Wind power plants on the high seas have two major advantages: They do not bother anybody and operate far more effectively due to higher wind strengths.



Technology that inspires: WinDrive for 3-megawatt class offshore wind turbines.

Anybody who has been near the sea knows it all too well. The wind never stops and can sometimes be quite gusty. The world's power companies meanwhile utilize this phenomenon; in future, wind energy will play an important role in global energy generation. Wind does not cost anything, it is an inexhaustible source and a clean one to boot.

The advantages of installing wind farms offshore are obvious. Out there in the lonely wet desert, nobody minds the huge rotors with a diameter of up to 120 meters. Once the construction phase is completed and the massive foundations have been planted at depths between 20 and 40 meters, disturbances to aquatic life are no longer relevant. Additionally, sea winds blow more fiercely, more evenly and over longer periods than on land. While onshore systems are expected to produce approximately 2000 full-load hours, offshore plants are likely to generate 4000 hours, i.e. twice as much.

The future prognoses for wind parks are therefore quite optimistic. Especially in the North Sea. Here, conditions are ideal for power generation: Together with the wind-swept Cap Hoorn at the southernmost tip of South Africa, the North Sea is among the world's windiest regions. It is practically never calm – up to 90 percent of the time, the wind blows at a speed of more than four meters per second. From this value, power production becomes commercially viable.

While the opportunities for wind parks on the high seas are enormous, the technical challenges are equally high. The plants have to be designed in such a way that they withstand the impact of the theoretically highest waves unharmed. We are talking of unimaginable monster waves of up to 25 meters, which have to be braved by the foundations and the tower without damage to the plant. This is why the bases of these systems can weigh up to 3500 tons, which corresponds to

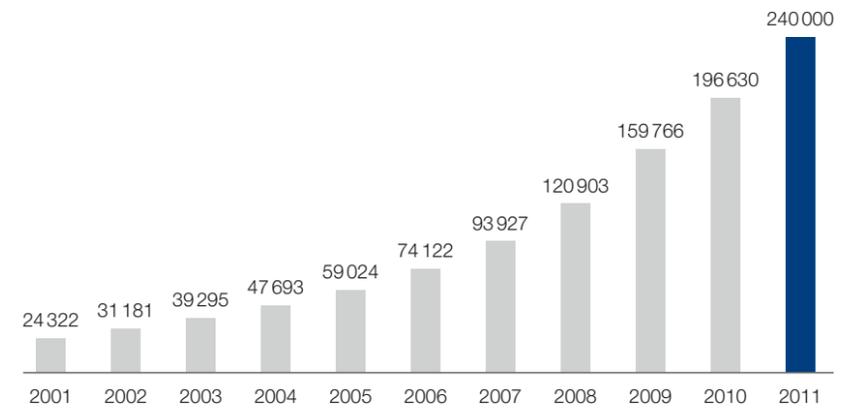
2000 medium-size cars. The WinDrive offers operators of offshore wind parks the same advantages as onshore: Reliable technology, no frequency inverters, electricity in power-station quality. The overall low service and maintenance requirements for the wind turbines is particularly important for offshore plants.

But Voith can soon offer even more in the field of energy generation on the high seas. The first supply vessels and construction vessels with Voith Schneider Propellers and the Voith Roll Stabilization System are already in service, ensuring high maneuverability and stability even if the seas are rough. A very effective feature – after all, wind parks are usually installed in places where the wind blows ferociously.

Voith WinDrive and Voith Schneider Propellers are therefore highly promising technologies for energy generation on the oceans – making sure that the wind finds its way straight into the socket in future. //

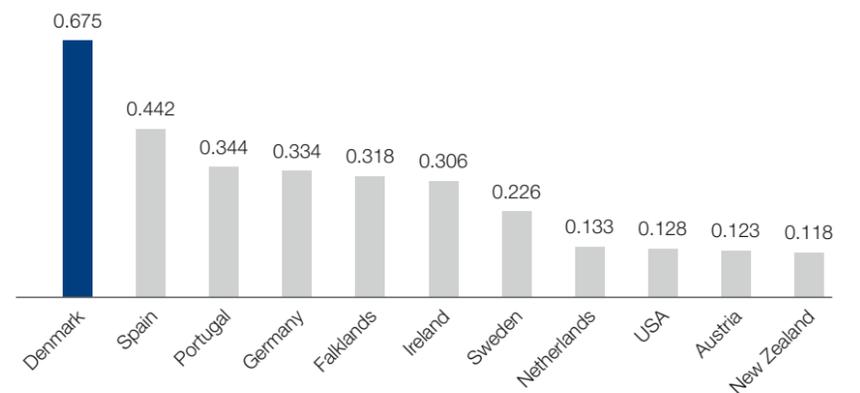
### Development of wind energy worldwide

Total capacity in megawatt, prognosis 2011



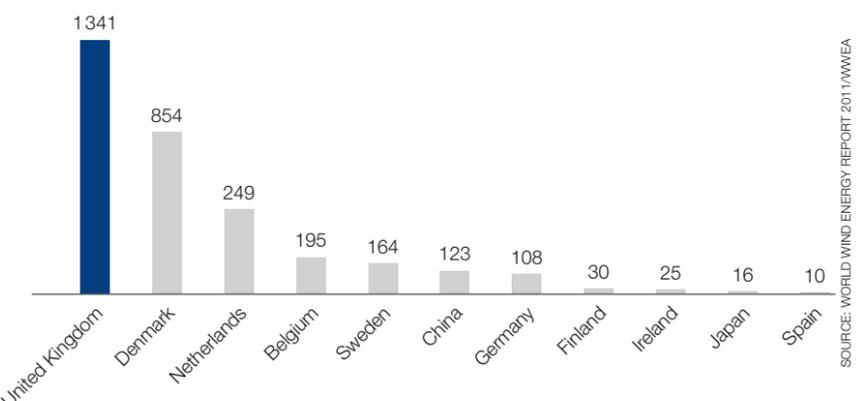
### Windenergy per head by nations

Produced output in 2010 per head in kilowatt hours



### Energy from offshore wind parks in 2010

Installed capacity in 2010 by nations megawatt



SOURCE: WORLD WIND ENERGY REPORT 2011/WWEA



Precision – for maximum safety: Work in the Voith plant in Shanghai on front ends for high-speed trains in China.

VOITH IN SHANGHAI

# RISING HEAT IN THE FAR EAST

The Chinese market is among the world's fastest growing economies. Voith products make a contribution to this boom. Since June 2011, Martin Wawra has been in charge of Voith Turbo in China and provides a first insight into his life in the world metropolis Shanghai.

“After 15 minutes”, says Martin Wawra, “I was shattered. But I hope this will change.” Well, possibly, but his flagging energy levels are likely to continue for a while. The hot and humid summer climate in Shanghai is really draining, and the 44-year-old will probably also have to forego his beloved football for a while. On June 1, 2011, the mechanical engineer took over as the new Executive Vice President of Voith Turbo in China and also as Regional Director for “Greater China”. After numerous business trips during the last ten years, Wawra is quite familiar with the Chinese market. But the leap of the former head of Voith Turbo Scharfenberg from Salzgitter to the Asian metropolis is still a massive challenge. “The Chinese clients are usually far more impatient, the market is highly competitive and customer loyalty is less pronounced than in Europe”, states Wawra. Which means that not only the climate is hot.

China's growth is enormous. In 2010 it was at about 9.5 percent, and the impatience of the customers is understandable. Everything has to happen quickly. Voith Turbo currently employs 314 people in the Chinese Republic. In the past business year, orders amounted to EUR 214 million, and sales totaled EUR 250 million. The Market Divisions Industry and Rail are about the same size and account for approximately 80 percent of the sales of Voith Turbo in China.

Martin Wawra knows a large part of the Chinese business from his previous activities. The former student of Stuttgart University has been a member of the Voith family since 1994. In August 2001, he was put in charge of Voith Turbo Scharfenberg. Since then he has mainly focused on coupler technology for trains. And couplers are currently the most important business for Voith Turbo in China. “At the moment we are busy to ensure that the Chinese

regional trains are fitted with Voith components. However, due to the high-speed train accidents, some programs have meanwhile been postponed. We hope that we can successfully conquer the rail market with our products, which are designed to increase passive train safety”, this is how Wawra outlines the perspectives. With the opportunity to offer crash-proof solutions to customers by individual combinations of front ends and Scharfenberg couplers, the market chances of Voith will surely increase. But efficient technology for trains is not the only focal point. Martin Wawra is thinking of two key areas when he talks about China-specific products. “In the Road business, we are starting with the localization of a new retarder, and in the Rail sector we are developing a metro transmission, which is primarily, but not exclusively, targeted at the Chinese market”, he explains.

Exciting times in an exciting country – a country that also covers a huge territory. Controlling such a vast market from Shanghai is of course a special chal- ▶



The Chinese world metropolis Shanghai is growing fast in all directions.



German high-tech products for the Chinese market: The manufacturing program of Voith Turbo in Shanghai includes components for trains.

lenge. “You have to compare China’s dimensions with those of Europe”, states Wawra. “A Chinese province is the same size as a European country.” And, as in Europe, there is no universal language in China. “Theoretically, Mandarin is the language of all Chinese people, but Shanghai has its own language like many other provinces”, he says.

Voith Turbo has concentrated almost all of its production to the west of Shanghai. “We will carry out assembly work here, but also at other locations”, says Martin Wawra. The company also plans to increase the number of Chinese engineers to ensure a better foothold for the company in the country. And not only that. “In some provinces we already have our own centers for overhauling and servicing our products”, states Wawra. “In addition, we work with agents. But our ultimate goal is to have our own sales offices in all provinces.” At the moment, Voith is also pressing ahead with the construction of a new plant in Shanghai for the local manufacture of Voith products. Lots of work to do then. At the same time, the Wawra family is also in the process of getting used to life in

the Far East. Many personal items were held up in customs for weeks on end. And the search for a suitable place to live required a certain amount of pragmatism. “You start by looking for a school, and then for a house for the family near the school. Afterwards, you decide what you want to take to China and what should better be left in Germany.” As in Germany, Wawra’s son will go to an international school in China, where English and Chinese are spoken.

And Wawra senior, too, has been learning the official language Mandarin since September. “This is really important for me, in order to get a better understanding of the culture and the mentality of the Chinese people”, says Martin Wawra.

A first start in the new country has thus been made. And now plenty of work lies ahead – football will have to wait a little longer. Probably just as well: From October, running will be a lot easier, because the weather in Shanghai will be cooler and much drier. At least this is what the climate statistics say. //

#### MARTIN WAWRA

is the Executive Vice President of Voith Turbo China. The 44-year-old mechanical engineer has been with Voith since 1994 and was head of Voith Turbo Salzgitter from 2001 until May 2011. He has been in charge of Voith Turbo China since June.



#### INTERESTING FACTS ABOUT THE VOITH GROUP

## FOR BRIGHT MINDS

Voith is a worldwide think tank and an ideas factory – in all industrial fields. Every year, the Voith engineers launch another 400 patents.

# 45000

... tons of fine art paper are produced every day on Hainan PM2 – the world’s largest paper machine. It was successfully commissioned in China in May 2010. The huge paper machine built by Voith is longer than six football pitches. The amount of steel used during its construction would have been enough to build three Eiffel Towers. The entire plant has 9300 switching circuits, five times more than a modern airbus. The freshwater consumption per produced kilogram of paper is about five liters. This is significantly less than the maximum limit of 10.5 liters prescribed by the Chinese government. //

# 22

... percent of the Group’s sales are generated by the Division Voith Hydro. In future, Hydro power will play a key role in the mix of renewable energies. This is why Voith is already looking intensively at possibilities to utilize waves, ocean currents and tidal forces for harnessing energy. //

# 5.2

... billion euros was the turnover achieved by the Voith Group in fiscal 2009/2010. In 50 countries all over the world, approximately 40 000 people work for the family-owned company, which is among the largest in Europe. A high percentage of the world’s paper production is manufactured on Voith paper machines: a quarter of the globally generated hydropower is produced by turbines and generators from Voith. The company has both strong roots and target-oriented structures for the future. //

# 400

... new patents are registered by Voith every year – making it the ideal environment for innovative, bright minds, and not just since today. Voith engineers have launched more than 11 000 active patents. And more will undoubtedly follow. //

... business sectors are covered by the Group Division Voith Industrial Services: Automotive, energy, petro-chemical, industrial and engineering services. The Group Division is a strong partner of various key industries. The credo of Voith Industrial Services is: Responsible action, innovative solution concepts and services with continuously high quality. Worldwide, the 170 locations of Voith Industrial Services, most of which are based in Central Europe, employ 19 000 people. The largest customers are presently General Motors, Ford, Honda, and Toyota. New market segments are currently opening in Qatar and India. //

# 4