

ttime

A MAGAZINE FROM TRELLEBORG GROUP

2-2018

Solutions that seal, damp and protect critical applications.

ON THE RIGHT TRACK

TIRES THAT HELP
FORESTRY MACHINES GET A GRIP.

SCREECH STOPPER



KEEPING IT CLEAN



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STOP THE NOISE

New antivibration solution stops trains from screeching as they go around bends.

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ROAD HEROES

A road under construction is a demanding workplace, both for the laborer and the equipment.



EDITORIAL

PEACE OF MIND

We have probably all experienced travel delays due to technical problems, such as with the train or plane we are traveling on. Unplanned stops or delays not only create great annoyance but can also lead to huge costs. Many of Trelleborg's products and solutions make it easier for companies to monitor exhaust equipment or flag underperforming components in order to plan when, for example, a machine needs to be stopped for maintenance. This is especially true in the capital-intensive mining industry, which you can read about on the following pages.



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Trelleborg joins a water purification research project, well suited for use in remote areas.

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FIT FOR THE FOREST

Forestry contractor WNK equipped its machines with Trelleborg tires and found a perfect fit.



Cover photo:
Martin Olson

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Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way. The Trelleborg Group has annual sales of about SEK 32 billion (EUR 3.28 billion, USD 3.69 billion) and operations in about 50 countries.

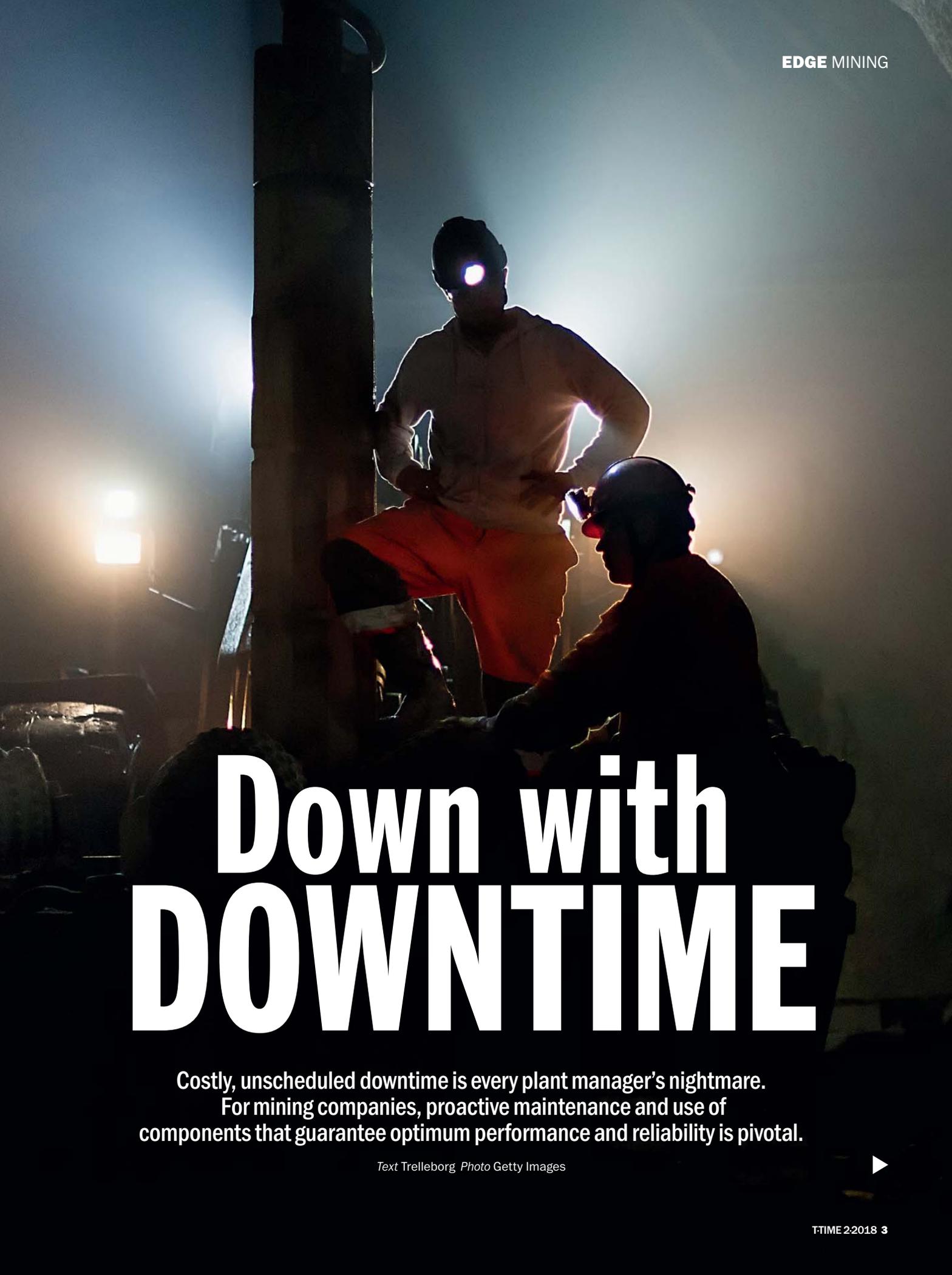
The Group comprises five business areas: Trelleborg Coated Systems, Trelleborg Industrial Solutions, Trelleborg Offshore & Construction, Trelleborg Sealing Solutions and Trelleborg Wheel Systems.

The Trelleborg share has been listed on the Stock Exchange since 1964 and is listed on Nasdaq Stockholm, Large Cap.




Peter Nilsson,
President and CEO


TRELLEBORG



Down with DOWNTIME

Costly, unscheduled downtime is every plant manager's nightmare.
For mining companies, proactive maintenance and use of
components that guarantee optimum performance and reliability is pivotal.

Text Trelleborg Photo Getty Images



Under increasing pressure to maximize income from mining, optimize operational excellence and find new productivity gains, operators can ill afford to exhaust equipment or rely on underperforming components. Avoiding costly unscheduled shutdowns and breakdowns is a priority, especially as mining operations are typically done in demanding conditions and operators try to achieve higher throughput rates. Obviously, extending planned maintenance intervals (shutdowns) can have a positive impact on the operators' bottom line.

Downtime is a significant issue faced by the mining industry, and mining and material processing professionals are always looking for ways to enhance availability of the equipment that crushes, grinds and transports ore. It is estimated that the total cost of unscheduled downtime in mining can be as much as 15 times that of a scheduled event. In general, mining equipment is vulnerable to breaking down due to the fact that the processes have to deal with a high tonnage of abrasive materials 24 hours a day, seven days a week, which can exhaust equipment. Therefore, components used must guarantee optimum performance and reliability, so that unexpected maintenance or replacement is minimized or completely mitigated.

"In the last couple of years there has been significant focus on cost-per-tonne reductions and plant availability. Trelleborg has supported our customers by leveraging our purchasing and manufacturing excellence programs, which have realized material improvements in tandem with reducing costs," says Colin Turnbull, General Manager Mining within Trelleborg Industrial Solutions in Australia.

One of the issues facing today's mines is the management of wet and sticky ores, which is compounded when mine chutes are tasked with handling larger flow rates of fine ore. A common obstacle to hitting process and production targets lies in the very nature of wet materials. They stick to surfaces, especially chute wall liners that clog and impede the flow of materials, resulting in decreased process rates, sometimes unplanned shutdowns and hours of hosing the chute to clear the buildup.

Many chutes are found throughout processing plants,



and their performance and upkeep are critical to ensure tonnage rates are met. Liner systems play an important role in protecting a chute from impact, wear and reducing or eliminating buildup.

Traditional liners used in chutes have often been simple hard metal or rubber designs that merely protect the chute walls from abrasion and damage. However, a large downfall of these systems is their inability to resist buildup due to their rigid construction.

In addition, chute lining systems are usually cumbersome to install and remove, so extended downtime is not uncommon due to the time taken to safely swap out the liners. This is one of the issues Trelleborg sought to overcome for its customers.

Keeping the customer's ultimate objectives in mind, Trelleborg designed and fabricated a made-to-measure system, the Flexible Lining System, or FLS. This modular solution is made up of a series of self-energized rubber panels, or "fingers," installed down the wall of chutes. "Our system utilizes a male/female interference fit rather than traditional nut and bolt



Colin Turnbull,
General Manager
Mining, Trelleborg
Industrial
Solutions.



“Trelleborg designs, manufactures and supplies rubber and composite ceramic liners to protect critical processing plants at mine sites. Our team of rubber chemists has recently developed a new rubber compound for mill liners, impact panels and screening media that is providing unparalleled wear protection of assets. This has delivered phenomenal results in field trials and created significant interest in the marketplace, as it is the first major advancement in wear-resistant rubber compounds for decades.”
Colin Turnbull, General Manager Mining within Trelleborg Industrial Solutions in Australia.

”



With no scaffolding required on the outside of the chute, installation and maintenance of a chute lining system is easier and quicker, while also lowering costs and improving safety.

fastening. Therefore, when replacing the fingers there is no need for scaffolding or personnel on the outside of the chute, which is a major cost saver for mining operations and removes a considerable risk to occupational safety and health from working at heights.

Trelleborg’s engineering team designs the hanger bracket system to fit the existing drill-hole configuration of the chute, so no modifications are required to the chutes. This makes it easy to convert chutes to a highly flexible buildup-resistant liner system. Trelleborg’s FLS system can be supplied with composite ceramic fingers for high-wear areas to further improve the wear resistance and durability while keeping wet, sticky materials traveling through chutes. The composite ceramic fingers reduce the likelihood of unplanned maintenance and extend shutdown intervals considerably.

“Feedback on the installation of the FLS at one of our key iron ore processing clients operations has been extremely positive, thanks in part to the system being so easy to install – the fitting up was perfect and not a single modification was required,” Turnbull says. ■

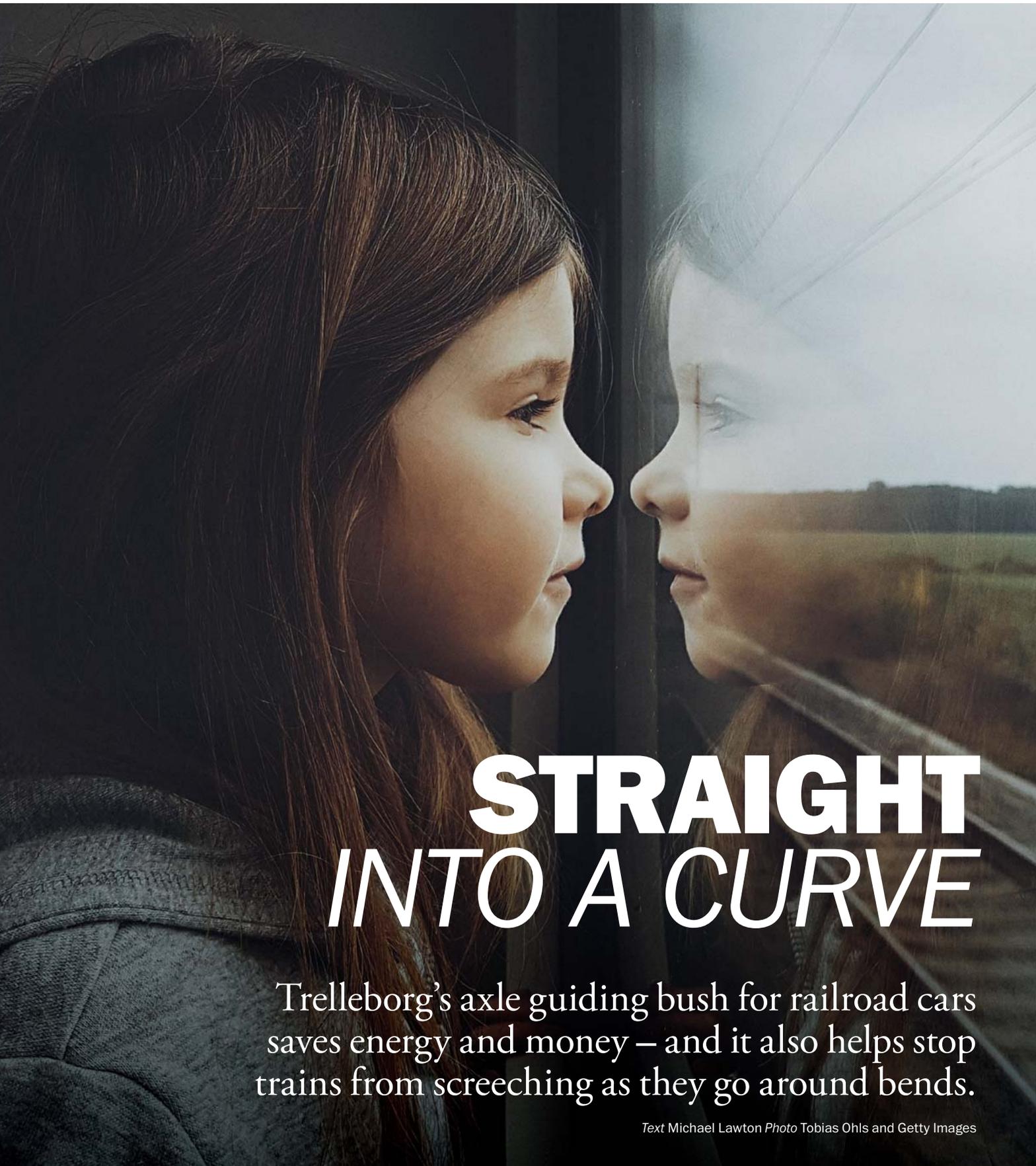
MINING EQUIPMENT

Trelleborg manufactures and designs products and solutions for the mining industry, solutions that control vibration and handle pressure in the most extreme working conditions.

- A variety of hoses, expansion joints and pre-formed hose bends including slurry hoses, suction hoses, discharge hoses, muff hoses and delivery hoses.
- Wear liner solutions for chutes, hoppers, deflectors and processing equipment.
- Screening systems, a light and flexible alternative to conventional steel wire mats.
- A complete range of conveyor skirting rubber systems including single hardness, multi-hardness layers and colored layers.

In addition, Trelleborg manufactures tires and tracks that are used on off-road vehicles operating in the mine and seals featured in off-road vehicle and mining equipment hydraulics. These sealing configurations are specially engineered to keep harsh media out of hydraulic systems, minimizing wear and extending operating life.

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STRAIGHT INTO A CURVE

Trelleborg's axle guiding bush for railroad cars saves energy and money – and it also helps stop trains from screeching as they go around bends.

Text Michael Lawton Photo Tobias Ohls and Getty Images



Getting a train around a bend is a bit like getting a square peg into a round hole – traditionally, railroad wheels and axles are set rigidly at 90 degrees to each other: they just want to go straight ahead, so they have to be forced to go around bends. A new development by Trelleborg allows the wheels to soften up a bit when they go through a curve.

“When running straight at high speed, the wheels should be as rigid and straight on the axles as possible, to provide a stable and safe ride,” explains Rüdiger Hack, Head of Engineering for Rail Applications with Trelleborg Industrial Solutions. “But when you go around a curve, you want the wheels to steer in the same direction.”

The Hydraulic Axle Guiding Bush (or HALL from its German initials) works by varying the longitudinal stiffness of the axles in the bogie, allowing the alignment of the wheel and the axle to be varied in response to different running conditions. This is done by allowing hydraulic fluid to flow between two cavities in the unit through a long, narrow channel according to the frequency of the vibration of the axle.

When the car is moving fast on a straight track, the frequency of the vibration in the system is higher, and the high frequency prevents hydraulic fluid from moving through a long, narrow tube between the two cavities. That makes the system rigid and the wheels and axle run tightly in the bogie. When the car is moving through a curve, the frequency of the vibration is lower and the fluid can move along the tube between the two cavities, allowing the wheel to steer in the direction of movement.



“



HALL can provide an advantage because of the savings on energy and wheel maintenance.

Özlem Arslan

► This has significant advantages: it stops the screeching of the wheels on a tight curve. Screeching is a sign that the wheels are producing very high friction levels. This can cause serious damage to the profiles of both wheels and track, potentially requiring regular regrinding and replacement, and wasting a large amount of energy.

The guiding bush technology was developed in 1997. It was tested on real passenger trains for ten years before it was put into series production in 2010.

“The rail engineering industry is very conservative, so we had to create the market for this new product – and that took a long time,” Hack says. The tests took place in two regions where there was practical interest in improving the efficiency of the wheel/rail interface.

“The first tests were in Switzerland – they have a lot of curves on the rail track because of the mountains,” Hack says. “Then we undertook tests in the U.K., where trains run perhaps three times as far per day as in other countries. The U.K. train operators were therefore very interested in reducing wear.” The two countries also share a policy of differential pricing for track use, favoring trains that do less damage to the track.

The results of the tests were remarkable. Trelleborg estimates that, taking energy costs alone, HALL will pay for itself in five years. If you add the savings in wheel maintenance, the return on investment takes just 2.5 years; and with track maintenance included in the calculation, you’re down to just 10 to 15 months. Hack asserts, “If you fitted HALL to the whole fleet running between Dresden and Nuremberg, a distance of 380 kilometres, you could save over 20 gigawatt hours of electricity over the units’ standard lifetime of eight years, enough for a year’s supply of electricity for a town of 11,000 people.”

The benefit is so great that one day 80 percent of all new intercity passenger cars in Europe will be fitted with HALL. But, says Hack, “The real market is in



retrofitting. HALL comes in a variety of dimensions so that it can be simply slipped in to replace existing bushes.”

Original equipment manufacturers (OEMs) have a particular appreciation for HALL, says Özlem Arslan, Sales Global Key Accounts at Trelleborg Industrial Solutions in Velten, near Berlin, Germany. “OEMs are under heavy pressure on price, but they also have to think about how they can sell a train on the basis of its lifetime costs,” she says. “That’s where HALL can provide an advantage because of the savings on energy and wheel maintenance – and if savings on track maintenance are reflected in differential track pricing, the argument becomes even more convincing.”

There are plans to roll out new versions of HALL, to cover freight cars and locomotives whose weight requires a different solution, and a “HALL 2.0,” as Hack calls it, which will include active electronic control. “Currently the system is passive,” he says. “It uses the self-steering ability of the bogie to position the wheel in the curve,



but the rigidity of the bush means the wheel position is not optimal. HALL 2.0 will actively steer the wheels using a responsive electronic system controlled by GPS, rail scanning and/or track data.”

But here too the industry is conservative. “The first customers are interested, but it may take 10 to 15 years before they’ll start using the responsive system,” he says.

The existing HALL, says Hack, is based on an idea from the automotive industry. “The same technology is used in motor and gearbox bearings to ensure that cars run gently when idling, and more tightly when driving at speed,” he says. “It means we just have to adapt automotive components.”

But applied to rail, HALL is almost revolutionary. Hack calls it “the first innovation in bogie suspension design in decades – comparable to the step from coil springs to air springs in the secondary suspension.” And he observes, “We have made a small contribution to showing that the rail engineering industry isn’t quite as conservative as we thought.” ■



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RÜDIGER HACK

Studied machine construction in Mannheim, Germany, with a thesis on “Vibration Reduction in Belt Drives.” Also trained as an automobile mechanic.

Joined the Technical Development Center of Freudenberg’s automotive division in 1997, moved to Freudenberg’s production facility for industrial rubber-to-metal components in Velten in 2004, and came to Trelleborg when Freudenberg’s Schwab Vibration Control was acquired in 2016.

“I’m driven by the complacency of our customers,” he says. “It makes me nervous and I want to break through it.” The best part of his job? “I have a wonderful team that we have gathered together over years, with world-class experts who are really passionate about what they do.”

In his spare time, he restores motorbikes and cars. His last project was, appropriately enough, a Citroën DS21ie, famous for its revolutionary hydraulic suspension.

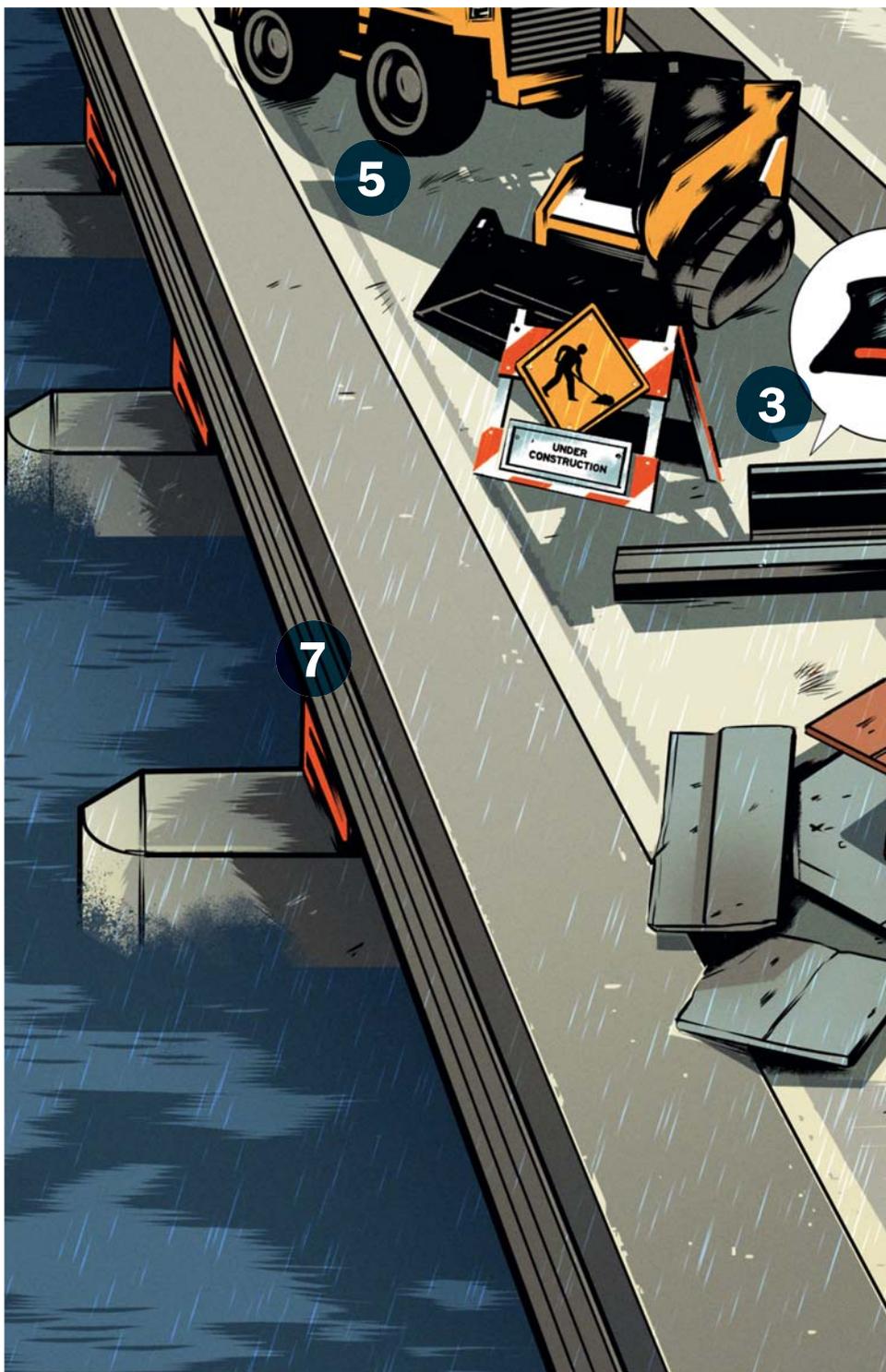


ROUGH ON THE ROAD

Try spending all day in the wind and rain, blasting, bulldozing and steamrolling to the relentless rumble of passing traffic. Here's how Trelleborg is making the road construction site a bit more bearable.

Text Petra Lodén Illustration Alexander Wells

Being a road construction worker is quite an endurance test. Operating in exposed places in harsh conditions is a reality for many equipment operators, who generally work long hours in the outdoors, come rain or shine – often far from home. Not only that, they also have to put up with the incessant noise of heavy passing traffic as they go about their duties. The road is a demanding workplace, not only for the operator, but also for their equipment. Trelleborg's solutions prolong the life of construction vehicles as well as ensuring the comfort and safety of the operator, minimizing downtime and maximizing productivity. ■



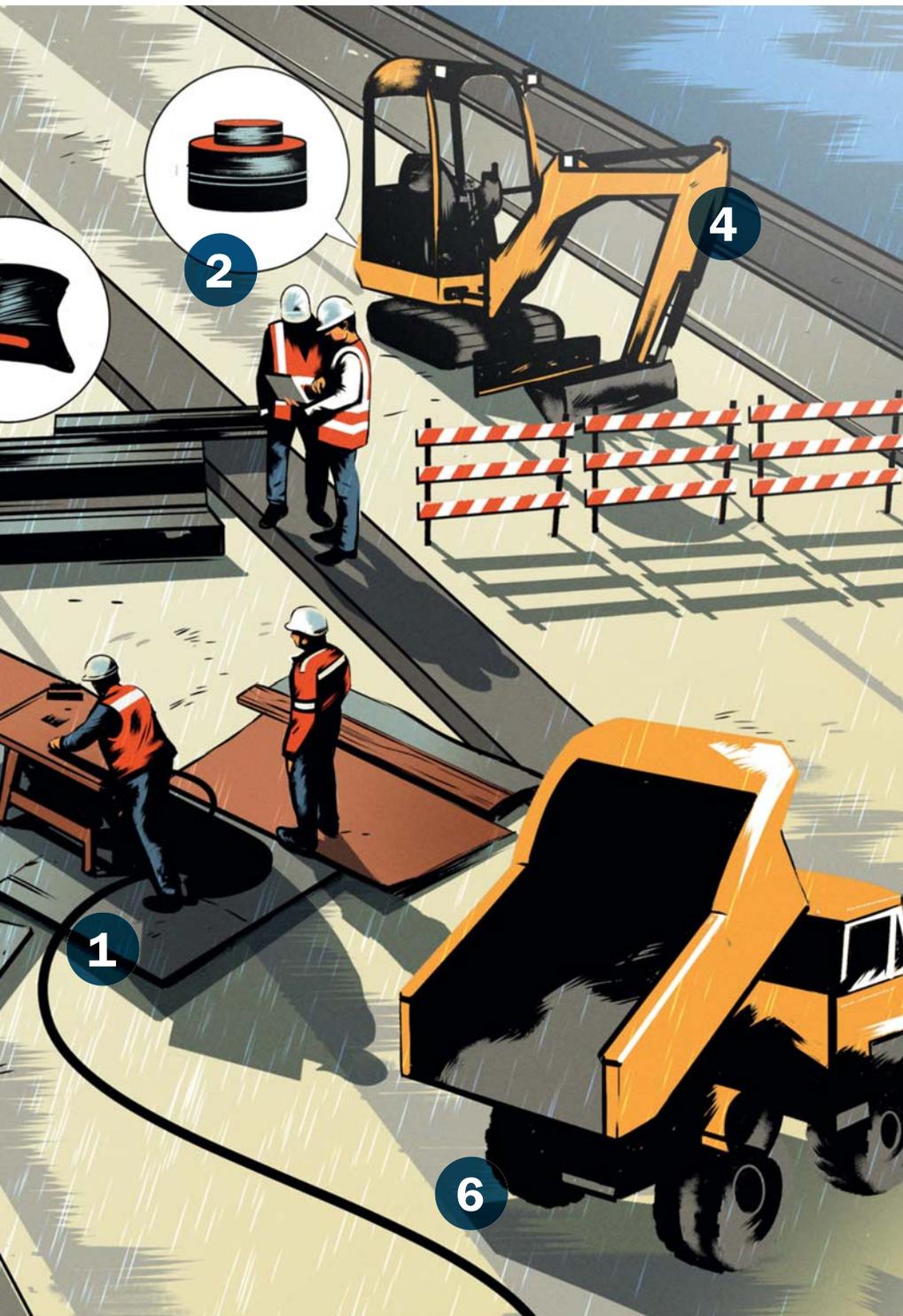
1. Hoses for pneumatic tools and general purpose compressed air hoses in industrial and other applications.

2. Antivibration and suspension solutions prolong the life of off-highway vehicles, increase productivity, improve safety and comfort.

3. Trelleborg high-pressure bags are capable of lifting loads up to 67 tons

with compressed air at a pressure of only 8 bar. Typical applications include lifting, moving, spreading and fixing.

4. The hydraulic systems of off-highway machinery require high-performance, long-lasting sealing solutions that are compatible with lubricants, operate at high pressure and in fluctuating temperatures, while minimizing friction.



5. Trelleborg offers a range of heavy duty, hard working tire and complete wheel solutions for construction vehicles.

6. Truck liners provide long-lasting wear resistance, working as an energy and noise reduction system. They absorb impact and protect a truck's structure from corrosion.

7. Bridge expansion joints absorb movement and ensure the comfort of traveling passengers, while bearings are designed to accommodate movements caused by wind, temperature fluctuations and loads.

FOR MORE INFORMATION
trelleborg.com/en/your-industry/buildings--and--construction

DID YOU KNOW?

USD 3,000

Building a single meter of highway costs about USD 3,000.

6.1 %

The Eshima Ohashi Bridge in Japan looks like a roller coaster. Ascending skyward before suddenly dropping down it has a 6.1 percent slope on one side and a 5.1 percent slope on the other.

60 countries

The Belt and Road Initiative (BRI), is the world's largest infrastructure project, proposed by Chinese government. This trillion-dollar project involves the shipment of goods on land and at sea through 60 countries, primarily in Asia and Europe.

Route 66

Running from Chicago, Illinois, to Santa Monica, California, in the U.S., Route 66 is perhaps the world's most famous highway, often featuring in music, literature and movies.

4.1 km

Passage du Gois is a 4.1-kilometer-long road between Beauvoir-sur-Mer and the island of Noirmoutier, off the west coast of France. Twice a day it is cut off, when it disappears under tidal floodwaters.

16.9 million

The top three countries with the largest road networks, the U.S., India and China, have a total of around 16.9 million kilometers of roads. The smallest network is in Tuvalu, a Polynesian island nation, with just eight kilometers of road.

Sources: Newsner, Ekonomifakta, Wikipedia

BLUE DIMENSION

Blue Dimension™ refers to Trelleborg solutions for better sustainability. They protect people, the environment, infrastructure and assets.

Trelleborg and its development partner Imaging Systems Technology, are working on a water purification system that is set to provide ready access to safe drinking water: the world's most precious resource.

Text John Frank Photo Getty Images



Water, water EVERYWHERE ...

Water, water, everywhere, nor any drop to drink...

This famous line from Samuel Taylor Coleridge's poem "The Rime of the Ancient Mariner" sums up a major problem faced by a large part of the world's population: the lack of access to safe drinking water.

The World Health Organization (WHO) has estimated that in 2015, 844 million people worldwide lacked even a basic drinking water service, and that at least 2 billion people consumed contaminated drinking water.

Rahul Maharsia, Director, Innovation Technology and Quality, within Trelleborg Offshore & Construction in the U.S., says: "In India alone there are 250 million households, and fewer than 10 percent of these have any kind of water purification facilities, so the issue is enormous."

Trelleborg hopes it may soon have a new product that will address the need for an easy-to-use effective water purification solution, a project being run through a joint development agreement with U.S.-based Imaging Systems Technology (IST).

Established in 1997, IST's work originally focused on the area of plasma displays. That involved looking at what is known as hollow sphere technology, with the company initially concentrating on the use of hollow spheres containing ionizable gas used as pixels for a display. As the technology evolved, IST's work branched out to other electronics-related areas. Its Plasma-spheres™ have been used in the areas of radio frequency (RF)

detection and RF shielding as well as ultraviolet and infrared scene generation.

In 2005, IST created a spinoff company, Deep Springs Technology (DST), that would look at potential uses of hollow spheres in non-electrical applications. It was found that these could be used in armor, for example. A new composite, LSAM (Lightweight Syntactic Armor Material), uses small hollow silicon carbide spheres inside a lightweight metal matrix to supplement existing armor systems and increase their effectiveness. "To us, every challenge looks like it could be solved with a hollow shell," says IST President and CEO Carol Wedding, only half-jokingly.

One of Deep Springs' most promising discoveries is a method of coating hollow spheres with a chemical, titanium dioxide, to purify water. Used in water filters, the system is particularly well suited for use in remote areas with no reliable power source or without a highly skilled workforce that would otherwise be needed in a large treatment plant.

Intrigued by IST's work, having heard it discussed at an industry conference, Trelleborg became inspired to enter into a joint development agreement with the company,



HOW IST'S WATER PURIFICATION SPHERES WORK

Titanium dioxide is already used in water treatment applications because of its ability to kill bacteria and break down harmful chemicals when exposed to ultraviolet light. But the challenge has been working out how to ensure that if, for example, titanium dioxide powder is used, it touches all the water it's released into, effectively killing all the bacteria and other harmful elements in it. Passing water through IST's spheres coated with the chemical solves that problem.

A bag full of densely packed spheres could serve as an easy-to-use water purification system, functioning in a similar way to the charcoal in home water filtration systems. Touched on all sides by the titanium dioxide-coated spheres, all the water passing through would become purified and safe to drink.

Sunlight is all the system would need to work, making it especially valuable in areas without a reliable power source or without the necessary skilled labor to run a large, complex water treatment operation.



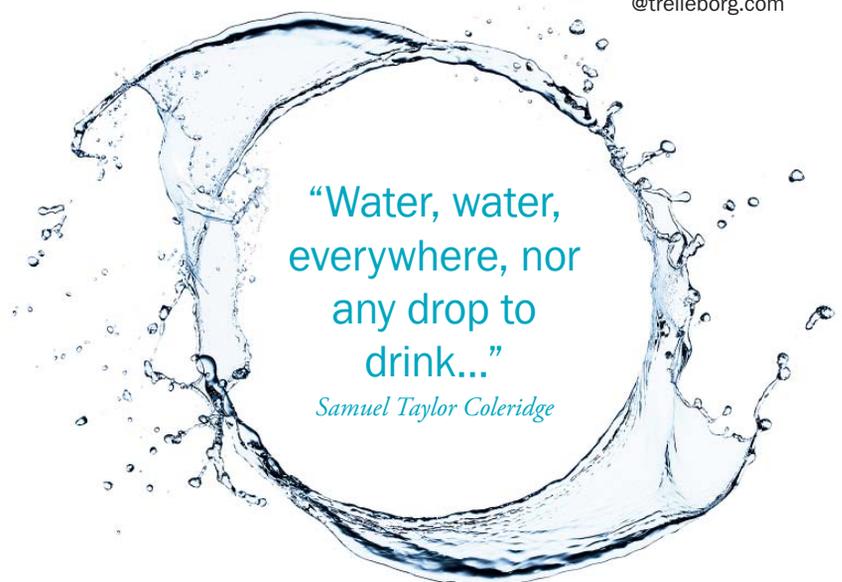
Maharsia explains. "There was quite a bit of interest at Trelleborg given the need for pure water around the world and how simple this technology could be," he says.

The goal for 2018 is to scale up production of IST's spheres so the water filters can be tested in a variety of conditions. "It's still an R&D project, but we are on the cusp of defining whether or not this technology works, outside the laboratory and small test environment. If it works, it will be a great solution to an environmental requirement," says Maharsia.

Wedding says: "We're going to require capital and infrastructure to move this stuff to market." IST has already received a USD 1 million grant from its home state of Ohio to work on its shell technology. It has been able to scale up production of the spheres for water purification from "liters of material in a day to cubic meters of material in a day," she says. Her hope is to begin field testing in the near future and then, working with Trelleborg, to bring its technology to the world.

If things go according to plan, many more people will be able to enjoy access to safe drinking water: the world's most precious resource. ■

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A PERFECT FIT

Sound environmental practices are crucial in the forestry business. That's why contractor WNK Skogsgallingr often uses wheel tracks on its harvesters and forwarders to increase bearing power and decrease impact on the forest floor. Its latest machine is fitted with Trelleborg tires.

Text Lars Österlind Photo Martin Olson

The nearest wind turbine is about 200 meters away. The swooshing sound of its giant rotor blades is clearly audible, and parts of it are visible between the tree tops. Forestry contractor WNK Skogsgallingr is clearing a two-hectare area of fir forest to make room for a sixth wind turbine.

"Our customer is in a hurry," says Niklas Nannestad, joint owner of WNK Skogsgallingr, as he steps down from a yellow harvester. "We have to be finished soon so they can start building a road."

On leaving senior high school at 19, Nannestad joined his father to start working on forest thinning, logging and afforestation. Today, he manages the company's projects from the cabin of one of the harvesters, making sure all 15 employees are fully occupied. Opening an app on his cell phone, he points to the long list of ongoing assignments.



WNK Skogsgallring drives large machines and always uses tracks to increase bearing power and minimize the impact on the ground. Niklas Nannestad, WNK (left), and Lars Eriksson, Product Manager, Trelleborg Wheel Systems.

WNK SKOGSGALLRING

Owners: Christian and Niklas Nannestad
Place: Munka-Ljungby, Sweden
Annual sales: USD 3.5-4.5 million
Number of employees: 15
Business: Forest thinning, logging, afforestation, timber mediation



Niklas Nannestad



TWIN FORESTRY T480 FOREST TIRES

- Perfect fit with tracks for exceptional grip
- Transverse grooves and a wide flat tire profile for optimized track usage
- Unique tread design with inter-lug terraces for effective self-cleaning and added pulling power
- Large surface area limits pressure and impact on forest floor.

Nannestad chose Trelleborg’s T480s having read good reviews about the tires. “Our sales contact at Ponsse recommended them as well,” he says. “We are satisfied with Trelleborg’s tires in general, and about half of our machines are now equipped with them.”

He says the biggest advantage of the T480s is the perfect fit between tires and tracks. “The tires have clearly been adapted to fit well with tracks, providing exceptional grip. This is an important feature because we drive large machines, and always use tracks to increase bearing power and decrease impact on the ground. This, combined with the transverse grooves in the tires, also means less slipping, the tires last longer and fuel consumption is lower.”

Modern forestry is a highly effective business. It takes Nannestad and his colleague just two to three working days to clear the area and produce 900 cubic meters of timber. “The challenge is to continuously become better and better,” Nannestad says, as he climbs into his harvester again. ■

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“Having several customers and various contracts to manage is a fun challenge,” he says. “They often all want timber at the same time, when the weather is fine, which gives me a complex puzzle to solve.”

The latest addition to the company’s collection of forest machinery is a brand-new Ponsse Elephant forwarder, equipped with eight Twin Forestry T480 forest tires. When fully loaded with timber, the vehicle weighs 45 tonnes. With such a heavy machine, it is essential to move around with caution; the effect of climate change bringing milder winters has increased the risk of ground damage, soil compaction and growth decline. Wet soil and a 45-ton machine are of course not a good combination, but the Twin Forestry T480 forest tires come well in hand. A wide flat tire profile creates a large contact area, which results in low ground pressure and less impact on the forest floor.

SMOOTH OPERATOR

Most drivers find brake noise and vibration intolerable. There's nothing worse than the sound of squealing brakes or the dreaded clunking of calipers. Trelleborg has come up with the ultimate noiseless solution, the key to a comfortable ride.

Text Birgitte van den Muyzenberg Photo Trelleborg and Getty Images

Hit the brakes and a high-pitched squeal can play havoc with the eardrums. As a complement to traditional solutions such as the anti-noise shim or insulator, a key piece of hardware can solve the problem completely: the damped abutment clip, otherwise known as the slipper. Any experienced mechanic will know about the impressive noise-damping effect of this crucial piece of equipment.

Trelleborg Sealing Solutions has come up with a unique solution that can be tailored to any sliding caliper brake system, ensuring its smooth operation – no shake, no rattle, just roll.

Imagine a carefully engineered “layer cake” of stainless steel and rubber holding the brake pad in place. Sandwiched between the brake pad “ear” and contact points in the anchor bracket, the abutment clip dampens the clunk or low-frequency noise by decoupling the pad ear, isolating it from the anchor bracket and preventing in-plane energy from being transmitted to the calipers. It also enables the easy retraction of the pad on the release of brake pressure, reducing the risk of residual drag.

Abutment clips have traditionally been made from uncoated stainless steel, but as car engines have become quieter, there has been a growing demand for noiseless braking systems with rubber-coated clips.

Trelleborg makes clips with a temper-rolled stainless steel core coated with PTFE (polytetrafluoroethylene) and rubber. “Only Trelleborg designs PTFE-coated clips with a range of rubber compounds in varying thicknesses with different surfaces,” says Johan Stjärndahl, Engineered Applications Director, Trelleborg Sealing Solutions. “That makes all the difference and sets us apart from the competition. Our flexible and efficient manufacturing method enables us to tailor our solutions to our customers’ specific needs.”

Flexible, nonstick, nonreactive and heat-resistant, PTFE minimizes friction (reducing the μ -value to 0.12 from 0.30), optimizes brake performance and enhances the robustness and durability of the brake pad. This means the pad can slide freely in the caliper, which in turn makes for lower fuel consumption levels.

This combined with the effective isolation, bond

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SOLUTIONS TO NOISE AND VIBRATION

Experts in engineering products that solve brake noise in disc and drum brakes, the Trelleborg team specializes in brake shims, which eliminate noise and reduce vibrations. Trelleborg Sealing Solutions is the only supplier offering a range of rubber compounds in various thicknesses and with different surfaces.

integrity and wear resistance of the rubber polymer layer makes for a winning proposition.

The best performance of Trelleborg's damped slipers is typically seen with frequencies ranging from 1 to 5 kHz. In some applications they also perform well at higher frequencies, particularly when the frequency of the noise coincides with the brake disc in-plane vibration frequency.

It is essential for abutment clips to be highly durable from both a mechanical and environmental perspective since they must withstand humidity, extreme temperatures and the corrosive effect of the salt in antifreeze.

"While on the one hand, the regenerative braking systems used in electric vehicles use much less friction braking, which might put our business at risk, the lifetime and performance requirements placed on our products will be even higher, so I would say the future looks bright for Trelleborg," says Stjärndahl. "Given the increasing number of electric hybrid cars on the road, noiseless brakes are essential. And we can offer products with an edge." ■



Abutment clips dampen the clunk or low-frequency noise by decoupling the pad ear, preventing in-plane energy from being transmitted to the calipers.

WALK AWAY THE DIRT



The Kåbe entrance mat is brilliant in its simplicity, yet highly efficient at keeping interior spaces clean.

Text Trelleborg Photo Kåbe-Mattan

It all began just over 70 years ago when an innovative caretaker at a bank was tired of seeing the dirt that customers tracked into the building from the streets. He took a few sticks of wood and some strips of rubber and nailed them together to make the first prototype of a new entrance solution: the Kåbe entrance mat.

The solution is simple and smart: dust and dirt that is removed from the shoes falls down between the mat's rubber strips preventing it going into entrance halls.

Trelleborg supplies 550,000 meters of rubber to the mat maker's manufacturing facility each year.

"Our cooperation with Trelleborg works very well," says Anders Åberg, Kåbe-Mattan's CEO. "We have a long history of cooperation. They know our needs and always deliver on time. An alert partner is very important for a small company like us that cannot keep large amounts of stock."

Nowadays, many of the entrance solutions are made from aluminum, adapted to customers' different needs and wishes. The matting can be corrugated for entrances that see heavy traffic, color-matched to the interior environment and gentle on high heels.

The primary purpose of an entrance mat is to remove dirt from the shoes that pass over it. The entrance mat is therefore often provided with different zones: a scraper grid zone, corrugated rubber strips and a textile zone. This system has been shown to protect floors exceptionally well.

"Our customer has successfully refined our rubber profile and managed to create a sustainable premium product that fulfills a practical need," says Jacob Möllvik, Sales Manager within Trelleborg Industrial Solutions.

The company that manufactures the mats has annual revenue of about USD 4.5 million and exports to the whole world. The product consists of 100 percent recyclable material and meets the highest demands of chemical content. To comply with requirements in public environments, it must also meet a range of fire-resistance standards. ■



KÅBE

There are a number of color options for scraping, cleaning and drying shoes.

FOR MORE
INFORMATION
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A man is shown from the chest up, wearing a VR headset. The background is a dense, multi-layered cityscape at night, with numerous skyscrapers and lights. The man's face is partially obscured by the VR goggles, and the city lights are superimposed over his features, creating a futuristic and technological atmosphere. The overall color palette is dominated by warm oranges and yellows from the city lights, contrasted with the cool blues and purples of the night sky.

From imitation to innovation

China is aggressively moving from a strategy of copying to one of inventing. The southern Chinese city of Shenzhen is already compared to Silicon Valley.

Text Jan Hökerberg Photo Getty images





Shenzhen is the most open city in China, a melting pot for entrepreneurs and the home of young dynamic companies.

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China has entered a new phase and is moving aggressively from a strategy of imitation to one of innovation.

Jan Hökerberg

TRELLEBORG IN CHINA

Trelleborg had its first major introduction to the Chinese market in 1972 at an industrial exhibition in Beijing, highlighting products for the mining industry. It established a subsidiary in Hong Kong in 1995, and within 10 years Trelleborg had 400 employees in China. By 2008 the company had a total of five production facilities in China. At the World Expo in Shanghai in 2010, it signed a declaration of intent to design and produce sealing solutions for an immersed tunnel forming part of the Hong Kong-Zhuhai-Macau Bridge project, one of a number of high-profile tunnel projects for Trelleborg in China. By the end of 2017 Trelleborg had around 1,600 employees in China and revenue of SEK 1,602 million (CNY 1,225 million, or USD 195 million).

The People's Republic of China is not only the world's most populous nation and the world's second-largest economy, it has also been dubbed the world's factory, where foreign-owned companies manufacture electronics and other consumer goods at low production costs.

Every day, most of us use products that are made in China.

For a long time, China was also known as the world's largest manufacturer of counterfeit and pirated products – from bags and watches to car parts and pharmaceuticals.

However, today China has entered a new phase and is moving aggressively from a strategy of imitation to one of innovation. Driven both by domestic needs and by global ambition, China is right now establishing itself at the forefront of technological innovation.

Take the southern Chinese city of Shenzhen, for example. In 1980,

China's first Special Economic Zone was set up there, where policies were implemented to attract foreign businesses to invest in China. At that time, the city had a population of only 30,000. Today, it is a modern metropolis of 20 million people linking Hong Kong to mainland China.

Shenzhen has become a melting pot for young entrepreneurs from all over China and for returnees who come back after getting higher education abroad. It is probably the most open city in China, and it allows companies to operate more freely than elsewhere on the mainland. It has the big advantage of being close to the manufacturing industry in Guangdong Province and also to Hong Kong, which has a well-established financial infrastructure and a highly educated workforce. Large technology companies such as Huawei and Tencent as well as the electric car and batteries front-runner BYD (Build Your Dreams) are all based in Shenzhen.

It is also the home of young dynamic companies such as Dajiang Innovation Technology Co (DJI), which less than 10 years ago was a small firm operating from a private flat in Shenzhen but which has since grown to a global corporation with more than 4,000 employees worldwide and 70 percent of the global market for commercial and consumer drones.

According to both the management consulting firm McKinsey & Company and the professional services company PricewaterhouseCoopers, Shenzhen is also the most sustainable city in China.

In December 2017, Shenzhen became the world's first city with an all-electric public bus fleet. It also aims to have 80 percent of its new buildings green-certified by 2020.

“Shenzhen differs from other cities because of its fantastic entrepreneurial spirit,” says Johan Nylander, a correspondent for CNN and Forbes

based in Hong Kong. “The city has also been allowed by the government to be a role model for other cities – it’s been allowed to both experiment and make mistakes.” Nylander is the author of the recently published book *Shenzhen Superstars: How China’s Smartest City Is Challenging Silicon Valley*.

According to Shenzhen’s 13th Five-Year Plan, released in 2016, more than CNY 100 billion (USD 16 billion), or 4.25 percent of its annual GDP, will be earmarked for R&D by 2020. The plan expects six emerging industries – the biotechnology, internet, new energy, new materials, IT and cultural and creative industries – to account for 42 percent of the city’s GDP in 2020.

Beijing’s Zhongguancun Science Park is another innovation center, and home to many established Chinese technology companies, from PC maker Lenovo Group to search engine operator Baidu as well as smartphone maker Xiaomi, which was established in the district eight years ago. The science park was approved as China’s first high-tech park in 1988.

Beijing has the advantage of having proximity to strong research universities such as Tsinghua and Peking University.

Innovation-driven Chinese companies such as Baidu, Alibaba and Tencent – together known as the BAT – were all founded at the end of last century and have now grown far beyond their core businesses of search engines, e-commerce and social media. Today they are finding new innovative business models and applications for cashless payment systems, autonomous vehicles, artificial intelligence (AI), big data analytics, robotics and much more. Analysts already compare them to Western global giants like Google, Facebook and Apple.

In October 2017, the Chinese government unveiled a road map to global dominance in AI by 2030,



forecasting the industry to be worth CNY 1 trillion (USD 159 billion) by then.

Chinese innovation today is not so much about new technology, but more about product development, new processes and business models. The Chinese mind-set is to work very fast and to quickly release products and services. The country has the advantage of a huge home market and the ability to find and develop new processes to reduce costs.

Chinese companies also have fewer barriers than Western companies to enter new areas and not just stick to their core products.

Western companies should be aware that their Chinese counterparts are on the way to becoming stronger competitors, not only by offering the lowest prices but also by making use of digitization and automation as a means to conquer both domestic and global markets. ■

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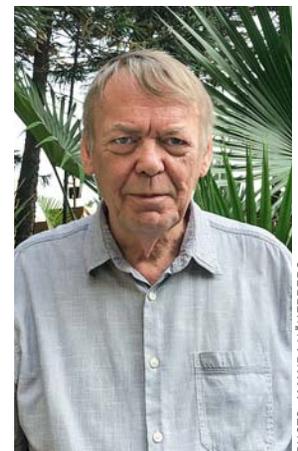


PHOTO: AMANDA HÖKERBERG

JAN HÖKERBERG

A Swedish entrepreneur, journalist and author. Over the past several years he has spent much of his time in Shanghai, and he has frequently published articles about China and China-related matters in numerous publications. He lives in Hong Kong with his family.



PHOTO: KEITH BERNSTEIN

HUDSON MIRACLE NOW A MUSEUM EXHIBIT

The original evacuation slide-rafts constructed from Trelleborg materials, used following the Flight 1549 Airbus emergency landing on the Hudson River in New York City, have been put on display along with the reconstructed aircraft at the Carolinas Aviation Museum in the U.S.

Most aircraft passengers pay little attention to the safety briefings given at the beginning of every flight. After all, accidents are extremely rare. But when they do occur, aircraft safety procedures and systems are vitality important.

In 2016, *Sully: Miracle on the Hudson* brought to the big screen the story of Captain Chesley Burnett "Sully" Sullenberger's January

2009 emergency water landing of US Airways Flight 1549 on the Hudson River in New York City. Sully became a hero, and all 155 passengers and crew members survived with only minor injuries.

Trelleborg played a vital role in the survival and safety of passengers after the emergency landing. The evacuation slide-rafts the passengers used to exit the plane, which provided flotation and protection from the freezing waters, were manufactured using engineered coated fabrics supplied by Trelleborg.

"The coated material is a detailed, engineered, highly specified and regulated

product," says Keith Dye, Operations Director within Trelleborg Coated Systems in the U.S. "People count on us to do our job correctly. Events like Flight 1549 emphasize to us the potential impact we have on lives, and make us appreciate the critical work we do a lot more."

Today the reconstructed Airbus is housed at the Carolinas Aviation Museum in Charlotte, North Carolina, where visitors can hear passengers' stories and experience the event and the impact it had. The original evacuation slide-rafts are also on display, along with an information plaque about Trelleborg and the role the company played in this miracle.



Capacity increased in France

Trelleborg Coated Systems has completed an investment program for its printing blanket operations at its Axcyl flexo sleeve production facility in Mirambeau, France, having commissioned a new oven, grinder and sleeve indexing processes. The project is part of an ongoing capacity increase at the site, which also entails the creation of the new position of Director of Operations, a role now filled by Katia Deycard.



APERTURE CALCULATION APP OUT NOW

A new app called the Scandura Aperture Size Selector has been released. Designed to support Scandura Screening Systems, the app will make it easier to calculate the aperture size required for screening applications for the quarrying, construction and recycling industries.

NEW PRODUCTION FACILITIES TO BE ESTABLISHED IN THE U.S. AND MEXICO

To support growth and boost production efficiency, Trelleborg Industrial Solutions is due to consolidate its operations for sealing profile production, establishing a new facility in Ohio in the U.S. The company has identified a greenfield site close to its current premises in Aurora for the new state-of-the-art facility, which is due to be completed in October 2018.

In relation to these streamlining actions, and to further improve productivity and efficiency, Trelleborg will be transitioning certain work flows to a new production facility in the city of Queretaro, Mexico. Close to the company's Mexican customer base, the facility will enable enhancements in terms of service delivery.



PHOTO: GETTY IMAGES

成功

New Chinese websites launched

As part of its strategy to offer customers local presence and global reach, Trelleborg has launched seven new websites in Chinese that are all locally hosted in mainland China. Patrik Romberg, Senior Vice President, Group Communications, says: "This project is part of a greater communications journey in China for Trelleborg, helping us to further strengthen our marketing activities and presence in the country."

DARTEX HOLDINGS ACQUIRED

Trelleborg has acquired Dartex Holdings Ltd., a manufacturer of coated fabrics for the healthcare and medical industry. Dartex has its head office and a production facility in Long Eaton, in the U.K., as well as another production facility in North Smithfield, Rhode Island, U.S. Annual sales amount to approximately SEK 135 million. This bolt-on acquisition is part of Trelleborg's strategy to strengthen its position in attractive market segments.

WHAT IS THIS?

Who you gonna call? Ghostbusters!
No, this is not something you bring to a ghost hunt. But what is it?

Answer at the bottom of the page.



Answer: Cross-sectional view of a Cryoline floating hose. This technology contributes to the expansion of LNG and increases safety by allowing vessels to be moored as far as 300 to 500 meters away from an onshore storage unit. Find out more in *T-Time* magazine issue 3-2017.

The background of the advertisement is a photograph of a field of tall, thin plants with small, light-colored seed heads. A bright blue light trail, resembling a long-exposure shot of a moving light source, cuts across the middle of the image from the bottom left towards the top right. The overall lighting is warm and golden, suggesting a sunset or sunrise.

Blue Dimension™ protects the environment

At Trelleborg, we believe that the benefits of our solutions stretch beyond functionality and business performance. Whenever possible they should also contribute to better sustainability. In fact, many of our solutions protect the environment and people, as well as infrastructure and assets. This is what we call Blue Dimension™ – Solutions for Better Sustainability.

trelleborg.com/bluedimension