

# ttime

A MAGAZINE FROM TRELLEBORG GROUP

2-2022

*Solutions that seal, damp and protect critical applications.*

**PLUS**  
EVERYDAY DRONES  
IN AUSTRALIA

A SEALING PROJECT  
LIKE NO OTHER

RAPID EXPANSION FOR  
WEARABLE MEDICAL DEVICES



## Sustainable electric travels

India is accelerating its EV transition.

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### AN ELECTRIC ADVANTAGE

Motorcycles and rickshaws are cheap and have low power requirements, making them ideal candidates for India's EV-revolution.

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### UNDERWATER JOURNEY

Work has begun on the world's longest immersed tunnel, the Fehmarnbelt Fixed Link, connecting Denmark with Germany.



**Cover photo:**  
Yulu Bikes

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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 34 billion (EUR 3.34 billion, USD 3.95 billion) and operations in about 50 countries.

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

[www.trelleborg.com](http://www.trelleborg.com)



## EDITORIAL

## EXCITING OPPORTUNITIES

**Our ambition is** to grow Trelleborg into the world's foremost engineered polymer solutions company in our selected industries, such as healthcare & medical, automation and aerospace, as well as in specialty industrial applications. We also see a great potential to expand into adjacent products and solutions that complement and strengthen our existing offering.

In March 2022, Trelleborg signed an agreement to divest its tire business area. It is a milestone in many ways, one being that Trelleborg will be exiting the tire industry, which we have been part of since 1905. However, while evaluating different

alternatives, we concluded that a divestment generates the most shareholder value and creates exciting opportunities going forward.

Much of this issue of *T-Time* is devoted to vital infrastructure. I am proud to present a deep dive into our solutions for water management.

Peter Nilsson,  
President and CEO





# Send in the drones

Drones delivering fast food, pharmaceuticals and supermarket items have become a regular part of life in the Australian city of Logan. Now, after a shaky start globally, drone technology could be on the verge of widespread acceptance and commercial success.

TEXT DANIEL DASEY PHOTOS WING ►

**I**n his grocery store in the eastern Australian city of Logan, Maz Rizk has just received a home-delivery order for one of his tasty roast chickens.

In other parts of the world, Maz might hand the requested dish over to an Uber Eats, DoorDash or Just Eat courier so they could take it by car or motorcycle to the customer. But things in Logan operate a little differently.

Maz's grocery store has partnered with drone delivery company Wing and fulfils multiple hot chicken orders from their site every day. The chicken, packaged in a customized cardboard box, is picked-up by a drone hovering overhead from a launch zone. A staff member secures the box to a clasp at the end of a line dropped by the drone and watches as it rises up and becomes secured against the underside of the drone. The unmanned aircraft then efficiently buzzes up and away.

"Customers love the drone delivery service," says Maz,

whose business, Friendly Grocer Crestmead, also frequently sends milk, eggs, bread and confectionary via Wing. "The drone can carry a load of up to 1.5 kilograms. It doesn't replace a full grocery shop, but it means our customers can save a trip to the store when they're short on time or if they've forgotten a few items."

**Consumers anticipating** the widespread roll-out of delivery drones have been on a rollercoaster ride since the concept first came to mainstream attention in 2013. It was then that digital retailer Amazon floated plans for the use of delivery drones to fulfil customer orders, via a service ultimately known as Prime Air. With such a large company advocating the idea, many imagined we were on the immediate cusp of an era when drones would become commonplace in our cities, carrying every type of consumer item.

But the reality is somewhat different. Nine years on, Amazon is yet to bring Prime Air to successful



**Above:** Drones will become more important, not only for everyday life but also for emergency care.

commercial fruition, despite countless hours of testing, promoting, and lobbying for regulatory approvals. Other drone delivery services have burst onto the scene with great fanfare, only to fade away not long afterward.

**However, the positive** experience of Wing in Logan has many drone delivery enthusiasts excited.

Dr Catherine Ball, a futurologist and associate professor at the Australian National University (ANU) points to the 'Gartner hype cycle' model to explain the faltering progress with drones to date. Developed by American research firm Gartner, the model aims to chart the path taken by innovative new technologies as they progress from development to wide

**Left:** A Wing drone can carry a load of up to 1.5 kilograms.



### Sealing new designs

Trelleborg uses its knowledge and expertise in aerospace sealing to support engineers designing drones, ensuring their effective operation whatever the conditions. Resisting harsh environments, specialized materials stand up to extreme temperatures, both cold at high altitude and hot at the height of the summer in Australia, for instance. To make sure motors and electronics have a long life without breakdown, a key focus is to prevent ingress of dust and water, protecting sensitive electric dynamic components.

## “I would say that drones are on the ‘slope of enlightenment’ right now.”

Dr Catherine Ball, associate professor at the Australian National University (ANU)



adoption. Initially, expectations tend to soar as people consider the potential benefits of a new technology. Then comes a ‘trough of disillusionment’ as it takes longer than expected for the desired results. This is followed by a ‘slope of enlightenment’ as businesses learn from their mistakes, and finally comes the ‘plateau of productivity’, as businesses successfully commercialize the technology and make money from it.

**Above:**  
A Wing team member prepares a drone for its next delivery.

“I would say that drones are on the slope of enlightenment right now,” says Dr Ball, who is also co-founder of the World of Drones and Robotics Congress. “There was a buzz around drones in 2015/16. Then, in 2017/18, they kind of started getting less sexy. More recently, during the pandemic, they have come into their own in a number of places.”

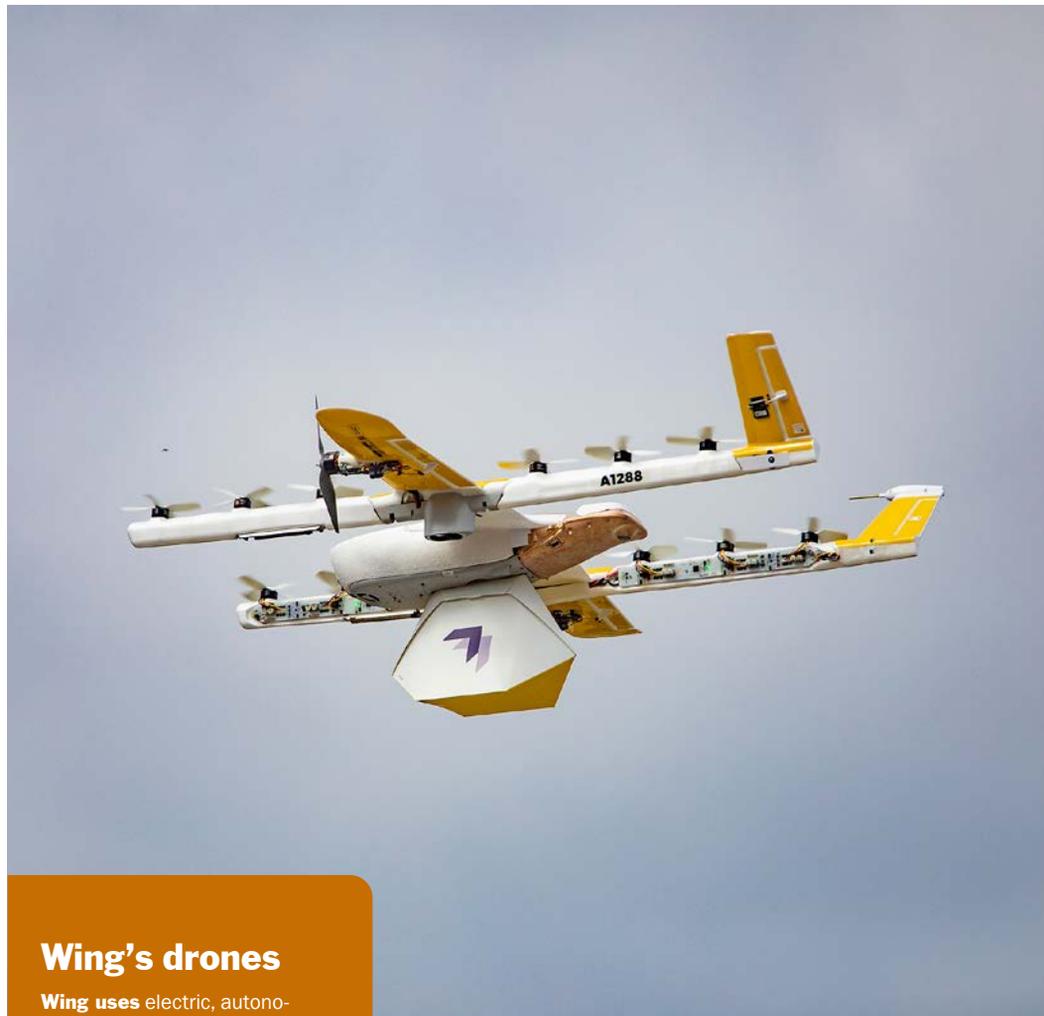
**Wing, owned by** Google’s parent company Alphabet, has been trialing its drone delivery services in Finland, the United States and Australia since 2019. In addition to the operation in Logan, Wing provides drone delivery in parts of Canberra, the southern Australian city that is the location for the country’s Federal Parliament and the country’s capital.

Ordering via the service is in many ways similar to ordering via a regular terrestrial delivery service. Users scroll through an app to choose from various offerings of coffee, fast food, groceries, confectionery, and pharmacy items, such as toothpaste. However, there are differences, too. To accept a delivery, the user must have a suitable open space nearby, free from powerlines and overhead trees. Also, deliveries are to a limited geographic area during the trial phase.

To date, Wing in Logan has successfully delivered tens of thousands of coffees, as well as thousands of loaves of bread and roast chickens. The company made over 140,000 deliveries to customers across its three countries of operation in 2021 – an increase of more than 600 percent from 2020.

**Catherine Ball** believes part of the success of Wing in Logan comes down to state authorities creating specific, stand-alone policies to permit and regulate the commercial use of drones. In most parts of the world, this is not the case. It might also help that Logan is relatively suburban, with many parks and open spaces.

Dr Ball says there are challenges standing in the way of the further roll-out of commercial drone operations around the globe. However, solutions are emerging. “Singapore and Toronto are both looking at having remote traffic management systems in place, with transponders and markers on drones. This would make it possible to see where drones are, in four dimensions. And this would allow for designated corridors where drones can fly and be tracked.”



### Wing's drones

**Wing uses** electric, autonomous, lift-and-cruise style multi-copter drones with a top speed of almost 100 km/h. These use 12 vertical lift propellers and two forward propellers.

**Each unit** weighs 4.8 kilograms and can carry payloads up to 1.5 kilograms.

**The drones** can travel about 20 kilometers before recharging, and multiple batteries and navigation systems are in place for the sake of redundancy.

Similarly, noise concerns, a common theme when discussing drones, are now addressed. New generation drones are far quieter than their predecessors and Dr Ball points out other delivery methods also involve some noise. “People get pizzas delivered on two-stroke motorcycles, which are actually quite loud.”

#### Above:

Wing made over 140,000 deliveries to customers across its three countries of operation in 2021.

So, what does the future hold? Dr Ball anticipates far greater commercialization of drone operations globally over the coming decade. In addition to drone deliveries, we can expect increased use of drones by emergency services. Drones might ferry supplies to snakebite victims or reach people stranded by floods. Government departments may use them to share documents, and B2B supply services for things like urgent spare parts are also likely to be popular.

“The whole area has matured so much in the last 10 years,” says Dr Ball. “And I think the next 10 years are going to see the realization of a lot of business models that people hoped were going to happen five years ago but haven’t got there quite yet.” ■

# NEWS



PHOTO: TRELLEBORG

## Divestment of Trelleborg Wheel Systems

**Trelleborg Group has** signed an agreement to divest its Trelleborg Wheel Systems business area to Yokohama Rubber Company for EUR 2,100 M, resulting in an estimated capital gain of SEK 6,000 M. Closing of the transaction is subject to approvals from relevant authorities and is expected to be completed in the latter part of 2022.

Peter Nilsson, President and CEO of Trelleborg Group, says: "Under Trelleborg's ownership, Trelleborg Wheel Systems has during the past few years more than doubled in size and substantially increased its profitability. Today the business is in great shape. While evaluating different alternatives for the Group we have concluded that a divestment at this valuation generates the most shareholder value and creates exciting opportunities going forward."

## 100,000 followers!

**Social media milestone** fast approaching! Trelleborg has nearly 100,000 followers on LinkedIn. If you have not already done so, make sure you follow Trelleborg Group for the latest news: [www.linkedin.com/company/trelleborggroup](https://www.linkedin.com/company/trelleborggroup)



PHOTO: UNSPLASH



## T-Time now 100% digital

**From this issue** onward, *T-Time* is a purely digital magazine, and print issues are no longer available. Trelleborg has shifted to an online format to lessen its environmental impact, but also to take advantage of the opportunities created by digitization and interactivity. Don't worry - there will still be a mix of great stories about Trelleborg and the industries it operates in. Keep an eye out for the latest issues on [www.trelleborg.com](https://www.trelleborg.com).

## Sudha Chandrasekharan

**Job title:** General Manager

**Lives:** Colorado, USA

**Family:** Married for 20 years, two kids. Son in high school, ready for college; daughter in middle school.

**Career in short:** I have chosen the paths that scared me the most. They are the ones that helped me grow the most and equipped me to do what I can do today.

**Free time:** I love hiking in the mountains of Colorado, gardening, painting and cooking.

**Fun fact:** I am a secret wedding cake decorator at night. I make delicious, good-looking cakes and pastries!



# CHAMPIONING DIVERSITY

The only way to win is together, as a team. Sudha Chandrasekharan knows this, which is why she always goes the extra mile to learn from and support her colleagues.

TEXT ÅSA BEXELL HOFFMANN

PHOTOS MATT NAGER

**W**hen Sudha Chandrasekharan took over as General Manager of Trelleborg's facility in Denver, US, in 2020, she was already well known for her professional achievements.

During her career of more than 20 years, Chandrasekharan has held senior positions with large companies in industries ranging from aviation and manufacturing to supply chain and logistics. Her prowess and passion for growing businesses and driving profitability have contributed to the success of numerous companies, while earning Chandrasekharan praise and recognition for her leadership.

Being an engineer herself and having profound knowledge of the industries that essentially make up the customer base of the Denver facility, the General Manager position at Trelleborg really appealed to her.

"I felt it was a role where I could make a difference to the business by applying the right functional and change management techniques. I know the industries we support. I have worked in several of them."

**Chandrasekharan joined** the company with the mindset of learning more.

"That mindset is what sets great leaders apart from average ones," she says.

"To learn the ropes at a new job, you can't expect someone to tell you what to do. You have to do the work yourself. So, leave your ego at the door and go talk to the person on the floor. Seek to learn."

During her first couple of months at the Denver facility, Chandrasekharan did just that. She cleared her schedule and joined her colleagues packing products.

"I learned so much from that





**“Diversity – from gender diversity to culture, age and race – has been shown to foster creativity and innovation.”**

Sudha Chandrasekharan, Trelleborg

experience. Not only did I learn how and why we pack our products the way we do, I also got to know the people who work here,” she says. “Some of them told me they were impressed that I cared, and found it very motivating that I joined them to pack. That has gone a long way in building a good culture here.”

While being General Manager requires Chandrasekharan to manage functions such as finance, operations, product, engineering, supply chain and logistics, she also has a responsibility to lead her team with a vision that will

propel company growth. That is a challenge she embraces.

“Driving the business forward with a winning team is what motivates me. I want to see my team win,” she says. “Watching my team learn and grow and creating new leaders really inspires me.”

Chandrasekharan takes great pride in her team’s accomplishments.

“Every time I see a plane take off safely, a vehicle safely transfer its passengers, or oil and gas installations perform efficiently, I feel we have contributed positively to that in some manner.”

**Above:**

Chandrasekharan and team members discuss a bearing friction test and how it can be automated.



**Left:**  
Bearing assembly.

**Her vision for** the Denver facility is that it will be known for its quality products and solutions, and for bringing added value to the company's global customers.

"The value is the quality and speed to market. My goal is to see Trelleborg achieve that," she says.

Chandrasekharan has always strived to challenge herself and use her skills in ways that benefit others – something she learned from her parents growing up in India.

"When I was a little girl, my dad would tell me to get off my seat, put in the effort and make something of myself," she says.

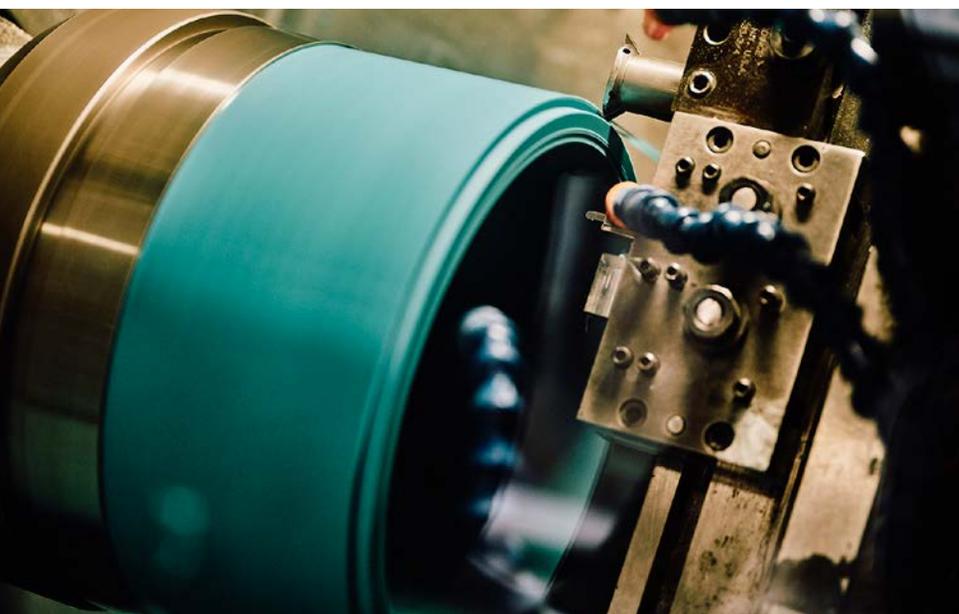
In a society where many women traditionally did not work outside the home, her father encouraged her to have an education and pursue a career that would contribute to a better world.

"People who can apply themselves and their skills to do good for humanity and the environment are the ones who make a difference.

I have always tried to do that," she says. Throughout her career, Chandrasekharan has been a key

**Below right:**  
Test equipment.

**Below left:**  
A CNC Machine  
creates seals.





**The Trelleborg facility in Denver, Colorado** designs and manufactures engineered Polytetrafluoroethylene (PTFE) seals and polymer bearings for the most extreme applications.



**“You have to do the work yourself. So, leave your ego at the door and go talk to the person on the floor.”**

Sudha Chandrasekharan, Trelleborg

catalyst for networks and programs that support and mentor women in traditionally masculine industries, such as manufacturing and supply chain. She believes a lot of talented women have been deterred from pursuing careers in these sectors by the perception that physical strength is required to be successful.

“Men and women will inevitably have different experiences and backgrounds, which shape their approach to business. Diversity – from gender diversity to culture, age and race – has been shown to foster creativity and innovation,” she says. “Tapping into the insights that both men and women offer can make products and services more marketable and a business more profitable.”

**Inspired by the support** she felt growing up, Chandrasekharan was instrumental in founding Trelleborg’s Women Influencers program. The intention is to encourage women to pursue careers in sectors traditionally perceived to

**Above left:** Chandrasekharan and her co-worker examine the quality of a machined seal.

**Above right:** The production hall in Denver.

be less suitable for them, build a supportive network of mentors, create a more inclusive and diverse workforce, and to connect women in the manufacturing industry.

“This program connects women leaders and delivers unique access to thought leadership and resources that can guide and support the next generation of women leaders,” she says adding:

“Women make up 50 percent of the world’s population, yet only one in four women in manufacturing holds leadership positions. That is a little sparse for me. I’m looking for equal opportunities.”

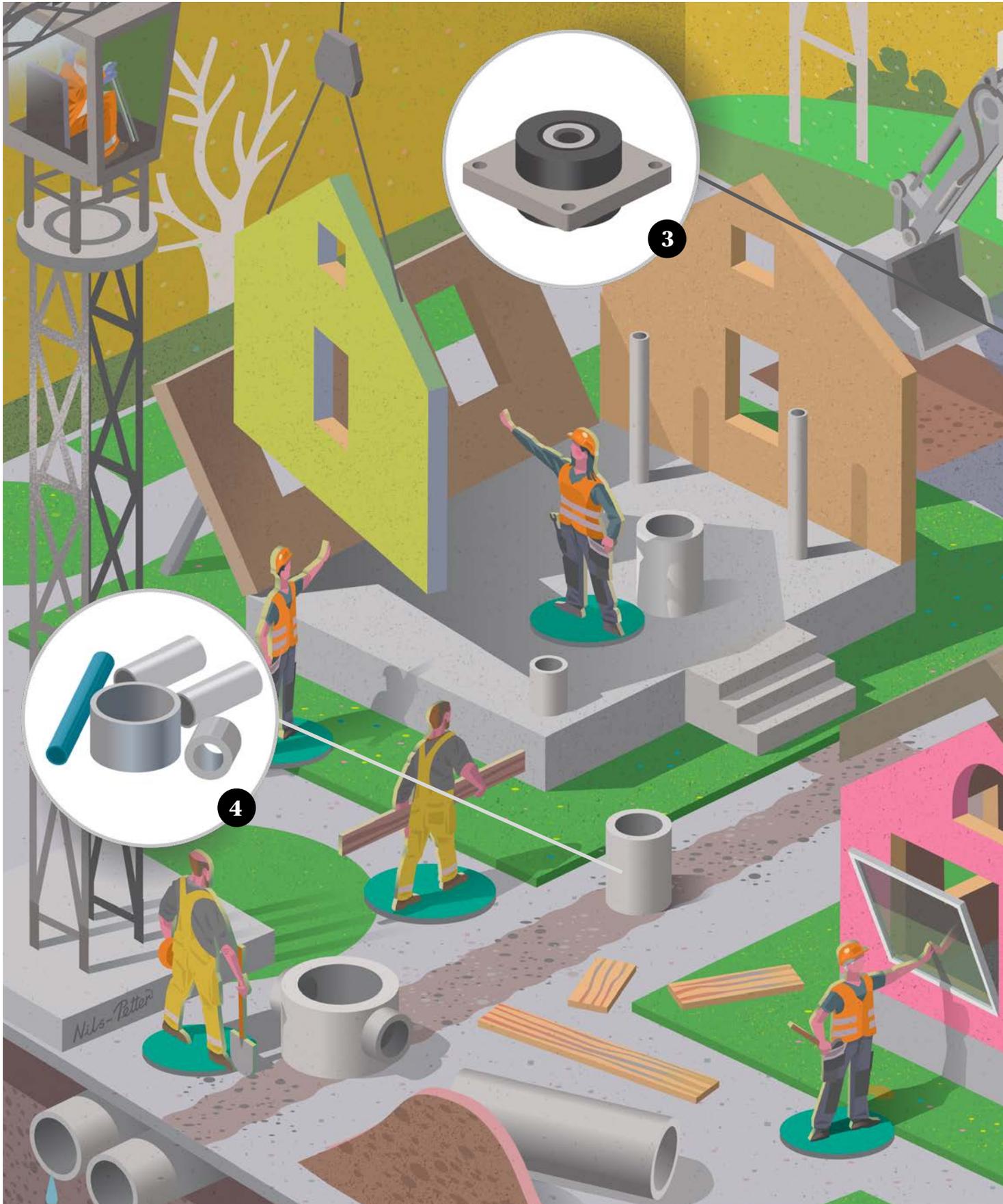
But a culture of gender and ethnic diversity is something Chandrasekharan appreciates about Trelleborg and will continue to foster.

“Having a diverse workforce is one of our most valuable strengths. It pushes our organization forward and helps us win as a team.” ■

**Left:** CNC machining with water.

*For more information:*  
[www.trelleborg.com/en/career](http://www.trelleborg.com/en/career)

**EVERYWHERE** PREFABRICATED HOUSING





**TEXT** DONNA GUINIVAN  
**ILLUSTRATION** NILS-PETTER EKWALL

# A ROOF OVERHEAD

**What is essential?** Everyone wants a safe home. With an ever-growing population, the demand for residential property is booming. That's been the catalyst to a flourishing construction market, for conventional buildings as well as modular ones that are sustainable and cut the time from breaking ground to moving in. Trelleborg innovations are sealing prefabricated houses, while its polymer solutions ensure construction equipment can work to the maximum and essential services reach the buildings.

**1. Seal profiles**  
Structural sealing elements in modular homes are multi-functional. They have outstanding weather resistance, prevent humidity, reduce noise, distribute weight, and separate materials for fire protection.

**2. Hydraulic seals**  
Inside cylinders and actuators in excavators and other construction equipment that facilitate lifting and moving of heavy loads, are seal configurations to give maximum performance and smooth operation.

**3. Anti-vibration solutions**  
Suspension components reduce costs by helping construction equipment to operate for longer without maintenance and to extend vehicle life. They enhance overall performance and improve operator safety and comfort.

**4. Water infrastructure**  
Watertight solutions include a wide range of high-quality seals for concrete and plastic pipes, manholes and connectors. These ensure safe and effective delivery of drinking water and the removal of wastewater.



PHOTO: PEXELS

**15 trillion USD**

Expected to grow by 4.5 trillion USD between 2020 and 2030, forecasts are that the global construction market will reach 15.2 trillion USD with 8.9 trillion USD in emerging markets in 2030.



PHOTO: SUSAN FISHER PLOTNER/VIEW/REX

**Your majesty**

England's royal abode, Buckingham Palace, is the most expensive house in the world with a current valuation of 6.7 billion USD.



PHOTO: FREEPIK

**1882**

Built in 1882 by Sir W. G. Armstrong & Company, the first excavator to use hydraulic technology helped construct the docks in Hull, England. Unlike today's excavators that use hydraulic fluid, water operated the hydraulic functions.

**Bread**

The traditional housewarming gift of a loaf of bread is given with the blessing of "May your house never know hunger."



PHOTO: FREEPIK

**billion**

There is a need for an estimated two billion new homes over the next 80 years to house a rising global population.

# A safe crossing

Providing transport for an ever-growing population, today's infrastructure is becoming larger and longer. That brings its own challenges. To meet these, Trelleborg's sealing systems, with their life expectancy of 120 years, protect infrastructure against water ingress, ground movements and water pressure.

TEXT CARI SIMMONS ▶

PHOTO: GETTY IMAGES

**T**he demand for watertight infrastructure has never been greater, as cities grow and climate change brings more severe storms, extreme ground movements and rising sea levels. According to the World Meteorological Organization the number of weather-related disasters increased five-fold in the 50 years to 2021, and in data captured by the Institute for Economics and Peace, flooding represented 42 per cent of all disasters from 1990 to 2019.

Urbanization is also playing a role in the changing situation, with expanding cities needing protection from sea and river water.

“Today, this is happening all over the world from USA, Bangladesh to Australia. The awareness of the need to protect urban areas against flooding is growing and we see more initiatives to turn the awareness into action,” says Rene Fredriks, Managing Director for infrastructure solutions at Trelleborg.

**Increased travel** is another of today’s trends and the desire to connect more cities has in turn fueled the demand for watertight immersed tunnels as a viable alternative to bridges.

“A bridge requires more space to build, whereas immersed tunnels, which go under waterways, have a smaller footprint and due to that are quite economical,” says Fredriks. Immersed tunnels also have a lower carbon footprint as they offer more direct routes to destinations and rail options, as opposed to sea freight.

There are now many immersed tunnel projects all over the world in response to economic growth and as a way for countries to reduce traffic



**Above:** Trelleborg has supplied components, services, and knowledge for the ShenZhong Link in China; the world’s widest immersed tunnel.

congestion. In China alone, there are plans underway for the construction of ten immersed tunnels. Trelleborg, with decades of experience in such tunnel projects, has become the leader in watertight infrastructure sealing solutions to protect submerged structures.

The company’s work on immersed tunnel infrastructure dates back to 1959, when Vredestein, later acquired by Trelleborg, was a supplier to the George Massey tunnel construction in Vancouver, Canada. Since then, Trelleborg has supplied components, services, and knowledge to almost 60 immersed tunnel projects, with the latest and longest being the new 18-kilometer Fehmarnbelt tunnel.

## Keep it sealed

In addition to seals for immersed tunnels, Trelleborg offers watertight infrastructure solutions to offshore wind foundations, storm surge barriers, sluice gates, dry docks and hydropower dams.



PHOTO: TRELLEBORG



**“The awareness of the need to protect urban areas against flooding is growing and we see more initiatives to turn the awareness into action.”**

Rene Fredriks, Trelleborg

Each project has its own unique challenges, depending on the amount of sediment, the seabed conditions, seismic considerations, water temperature and sea depth. There are also unique factors affecting immersed tunnels, such as the possible impact of a sinking ship.

For each immersed tunnel infrastructure project, Trelleborg customizes three critical components – the Gina gasket, the Omega seal and the Waterstop. Designed and tailor-made to ensure the best-fit watertight solution for each immersed tunnel project and its intended application, the Gina gasket and Omega seal prevent water leaking into the tunnel through external pressure, and Waterstops accommodate water pressure and any movement that occurs due to settling of the structure.

All three of these Trelleborg solutions are made of high-quality engineered rubber, which must maintain its elasticity, while still being robust enough to endure demanding saltwater conditions.

**Trelleborg’s sealing** systems have a life expectancy, requiring little or no maintenance, of up to 120 years. This is critical for immersed tunnels as access to the structures can be difficult.

“We have conducted aging tests with an independent institute that confirmed our compound for engineered rubber. This is natural and very flexible, and can last 120 years underwater,” says Fredriks, adding that rubber generally lasts longer underwater as it isn’t exposed to ozone; the most responsible cause for deterioration.

## Trelleborg’s three sealing systems for immersed tunnels

### **GINA GASKET**

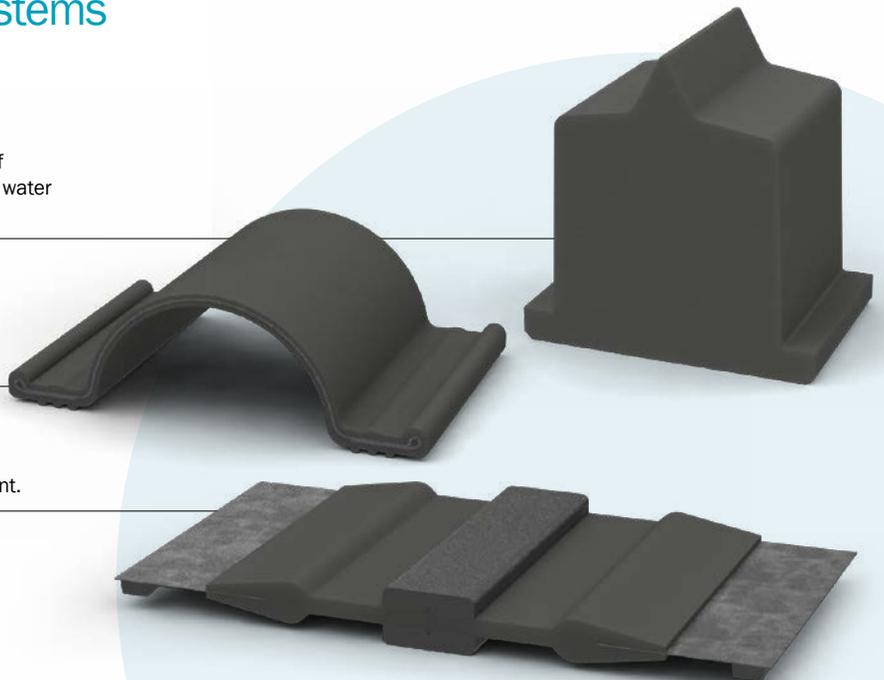
The Gina gasket is used between the sectional elements of immersed tunnels to prevent water ingress due to external water pressure and to absorb the effects of movements.

### **OMEGA SEAL**

In immersed tunnels, Omega seals function as a secondary water barrier to back up the Gina seal.

### **WATERSTOP**

Waterstops seal joints between segments in a tunnel element.



## PROTECTING THE ESSENTIAL WATERTIGHT INFRASTRUCTURE

“Our customers rely on more than just our products, they also depend on our specialist knowledge, design and engineering expertise, manufacturing capabilities, combined with best-practice design, quality materials and proven track record.”

**Included on Trelleborg’s** long reference list is the Öresund Bridge and immersed tunnel, which connects Sweden and Denmark. The crossing under the Öresund Strait has eased access and improved commercial opportunities for the two Scandinavian neighbors since it opened in 2000. The tunnel includes 20 pre-cast concrete elements, each weighing 55,000 tons. Trelleborg supplied a specially designed Gina gasket to seal tunnel sections and vulcanized the waterstops on-site due to the logistical challenges of this huge project.

Trelleborg also played an important role in the Hong Kong-Zuhai-Macau Bridge and immersed tunnel project, which opened in China in 2019. The mega-link project improves the flow of traffic between Hong Kong, Macau and Zuhai and was especially complex because it combined a bridge, tunnel, and artificial island. At almost six kilometers in length, it is currently the longest deep-water immersed tunnel. The challenges there included water depths of over 40 meters, a heavily trafficked area and potential seismic activity, meaning the seals have to be resilient to earthquakes and other ground movements. Trelleborg’s role was to ensure that the 33 tunnel sections remain safe deep in the sea.

Trelleborg is also a supplier of tunnel sealing systems to the world’s widest immersed tunnel, the ShenZhong Link in China.

**“Our customers rely on more than just our products, they also depend on our specialist knowledge, design and engineering expertise, manufacturing capabilities... and proven track record.”**

Rene Fredriks, Trelleborg

At a width of up to 46 meters, it will include eight lanes of traffic and have capacity for 90,000 cars per day. The tunnel to consist of 31 sections, with a typical section being 185 meters long and the broadest up to 70 meters wide. Trelleborg’s Gina gaskets and Omega seals will be between the sectional elements, preventing water leaking in due to external water pressure and to withstand movements caused by soil settlement, creep of concrete (when it deforms under constant load), temperature effects and earthquakes. The ShenZhong Link is due for completion in 2024.

“At Trelleborg we offer a cost-effective solution with an extended service package and warranty. This is backed by a strong reputation and over 100 years of experience and expertise in engineered solutions to seal, damp, and protect infrastructure and offshore assets,” says Fredriks. ■

For more information:  
[rene.fredriks@trelleborg.com](mailto:rene.fredriks@trelleborg.com)



Part of the **Öresund Bridge** was considered a possible danger to air traffic from Kastrup. Therefore, the bridge turns into a tunnel the last four kilometers before Denmark.

PHOTO: GETTY IMAGES

# NEWS



## Boosting patient care

**Hosing and tubing** technology is vital for healthcare & medical applications, from wound care to catheters, and drug delivery to feeding tubes. There is a huge range of designs available, from classic single, hollow tubes to multi-lumen extrusions with stops, bumps, and varying thicknesses in the same tubing. A new whitepaper by Trelleborg looks at how engineered extrusion helps medical device-makers enhance their products. It is a must-read for designers, who can find out how innovations can improve patients' quality of life.



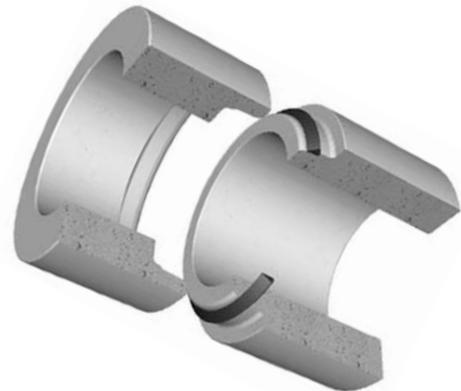
## Qingdao expansion complete

**Reflecting rapid growth** in the Chinese market, Trelleborg has expanded its manufacturing facility and sales office for marine and infrastructure products in Qingdao by over 50 percent to more than 23,000 square meters. The larger facility will further strengthen Trelleborg's R&D work on compounds and polymer technologies and improve operational excellence and innovation.



## Lifting bags for firefighters

**Trelleborg in Slovenia** recently donated lifting bags to volunteer firefighters in the village of Begunje na Gorenjskem in the Municipality of Radovljica, Upper Carniola region. The bags, manufactured by Trelleborg, can lift firefighting and other vehicles in emergency situations.



## Trailblazing sustainability

**One of the** trailblazers in Trelleborg's sustainability journey is its manufacturing facility in Bielsko-Biala, southern Poland, which has been running on 100 percent renewable wind and hydropower since 2021. As Trelleborg's largest manufacturer of seals for plastic and concrete pipes, and manholes and connectors, used in both drinking water and sewer applications worldwide, when it switched from coal-fired electricity to clean energy it improved the environmental impact of the entire Group!



# Keyhole surgery for pipes

Trenchless pipe rehabilitation, instead of the traditional “open, cut and replace” method, is an ideal solution for repairing pipe networks in big cities. It saves time and money and leads to less disruption and environmental contamination.

TEXT JAN HÖKERBERG

**A**sia-Pacific is the world's largest and most diverse water infrastructure market. A common problem throughout the region is aging infrastructure and increasing water leakage. For example, in Australia and New Zealand, much of the infrastructure is reaching the end of its 50-year lifespan. Meanwhile, growing populations and climate change are adding to an increasingly challenging situation.

Every year, Australia's largest city, Sydney, loses about 47 billion

liters of drinking water to leakage – about 52 Olympic-sized swimming pools a day – and is experiencing a sharp growth in the number of “high-priority” leaks. With periods of prolonged drought now increasingly common, municipal water supplies are under extreme pressure, creating the need for more sustainable water cycles.

In New Zealand, it is estimated that more than half of the pipes in the capital city, Wellington, need replacing, at a cost that is expected to run to about NZD600 million (USD400

million) over the next decade.

Furthermore, many big Asian cities lose up to 40 percent of their drinking water supply to leakage, compared with 20 percent in many cities in Europe and the United States. Water loss happens for several reasons, including the complexity and quality of pipe installations, and is becoming a growing – and expensive – issue for local water authorities and asset owners alike.

When a drinking water pipe leaks, the escaped water often finds a path underground, where it is wasted

**“By replacing traditional trench-based technology with a trenchless pipe repair, the work usually completes in one night, which gives huge financial and environmental benefits.”**

William Wong, Trelleborg



in a process known as exfiltration. However, as well as the loss of valuable drinking water, contamination of the pipe can also occur by the infiltration of pollutants from the soil, for example those originating from overfertilization, or defective or incorrectly laid drainage pipes.

A defective pipe is susceptible to root ingrowth, backfill, and even breakage. Continuous water leakage washes out the surrounding soil and can ultimately lead to the failure of the drainage pipe, the collapse of roads and flooding.

**In cities,** traditional “trench-based” repair methods are becoming less feasible in busy urban centers with increasingly complex underground infrastructures.

“Think about what’s beneath a typical city street,” says William Wong, Business Development Manager for Trelleborg’s pipe seals in the Asia-Pacific. “You have water and gas mains, electricity, sewage pipes, and probably even fiber-optic cables intersecting with each other, and the more populated a city is, the more underground infrastructure is required. That’s not to mention everything you see at ground level. So, in most cities, there’s physically no room to lay new pipes inside a repair trench.”

It is also a question of time as

blocking off a street and digging up a single water pipe can take many months, causing major disruption to businesses and residents.

However, there is a solution to all these problems.

“By replacing traditional trench-based technology with a trenchless pipe repair, the work usually completes in one night, which gives huge financial and environmental benefits. A trenchless pipe repair is like a surgeon performing keyhole surgery rather than cutting the patient open,” says Wong, who has worked with pipe rehabilitation for over 20 years.

Pipe rehabilitation still depends on two factors. First, the rehabilitation itself must be more efficient in terms of time and costs, and less disruptive and polluting than the trench-based method. Second, the repairs need to stand the test of time; rehabilitation becomes a false economy if it leads to repairs more often.

The pipe rehabilitation technology is called cured-in-place pipe (CIPP) lining and is considered to be a quieter construction methods, compared to the traditional “open, cut and replace” method.

In the trenchless method, a new and thinner CIPP inserts into and connects to the old concrete or steel host pipe to prevent leakage.

Even if the cross-sectional area is smaller, the flow rate capacity will increase, since the material is much smoother than the original pipes. This technology is well-suited for big cities and many of these have started to embrace it.

“Hong Kong has recently executed a major program to replace and rehabilitate water mains across the city, while in Singapore they have rehabilitated a majority of their network to be more water-sustainable. And, to my understanding, several big cities in China have all recently launched or are in the middle of launching major programs for rehabilitation of pipelines,” Wong says.

Trelleborg has both the expertise and a large range of products to support pipe rehabilitation projects. It is Wong’s ambition that Trelleborg will be a partner in many forthcoming projects in the region, helping to create a more sustainable and water-tight future for Asia’s big cities. ■

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### Customized solutions

Trelleborg has customized solutions for virtually any challenge in pipe laying and rehabilitation.

“We have materials, equipment and accessories to assist with the insulation of pipes. In the rehabilitation of sewer pipes our flexible pipe liners work in combination with our polymer resin systems. Furthermore, our stoppers and flow-through plugs are optimally suited for the temporary blanking off and bypassing of flows during pipe tests and repairs. For smaller local leaks, we can use a resin-impregnated fiberglass mat, thus providing a quick remedy,” says William Wong.



**Moushumi Mohanty** and her staff have led a CSE think-tank with several Indian states. The aim was to form more detailed plans to successfully navigate the continued EV transition.

# Electrifying India

The electric vehicle revolution has arrived in India, but not how you might think.

TEXT PATRICK GOWER PHOTOS AMIT DEY

The e-scooter ePluto 7G by PureEV can seat two people and has a range for 90-120 kms per charge.



“**E**lectrification is here, but it’s on two and three wheels, not four,” says Moushumi Mohanty, head of the Electric Mobility Programme at the Centre for Science and Environment (CSE), a New Delhi-based think-tank.

“The government is providing large subsidies to the two- and three-wheeler segments and together they will lead the country’s electric mobility goals in the short-to-medium-term.”

Motorcycles and three-wheelers – mostly rickshaws – are relatively cheap, popular and have low power requirements, making them ideal candidates for electrification on a large scale. More than half of the Indian government’s subsidy package designed to speed up the manufacturing and adoption of electric vehicles aims at two- and three-wheelers.

The Indian Government does not lack ambition. It wants 30 per cent of new vehicle sales to be electric by 2030, a target that would require

the electric vehicle (EV) sector to expand at an annual rate of 46 per cent, right up to the target date.

At first glance that looks plausible, at least for two and three-wheelers. Between 2011 and 2019, the electric two-wheeler market grew at an annual rate of 19 per cent, while the electric three-wheeler market expanded at a rate of 73 per cent, according to the CSE think-tank. However, these gains were from an almost standing start, and they become harder to reproduce as the market becomes larger.

**Despite all that** rapid growth, the market for EVs remains tiny in relation to that of combustion engines. Two-wheelers made up more than 84 per cent of EV registrations in 2021, yet they have just a 0.15 per cent market share of the total market for two-, three- and four-wheelers. That makes reaching the government’s 2030 target a tall order.

“The numbers aren’t quite so impressive yet, but we do expect

**Right:**

The Yulu Miracle bikes are available for rent for last-mile connectivity at metro stations. Commuters rent them from one Yulu zone and drop them at another.



PHOTO: GETTY IMAGES

them to take off over the next two to three years,” says Mohanty.

Rising take-up is partly about product availability – one of the many “chicken and egg” situations that have challenged the expansion of the electric vehicle sector globally. Producers often want guarantees that a deep pool of demand exists before they will ramp up production, while consumers need to have genuine choice to be able to purchase in large enough numbers. Mohanty says that the same has historically been the case for charging infrastructure, with



stakeholders reluctant to invest for small numbers of EV owners.

“It requires the producer and the consumer to spend on the new technology for it to gain traction, then the momentum kicks in,” she adds. “There have been some big commitments made to developing charging infrastructure and clearly the numbers have to be much larger, but India is working on it.”

**Momentum is indeed building.**

Last year, electric scooter manufacturer Ola pledged to spend 2 billion USD on a factory in the southeastern



**“It will be back and forth, back, and forth. I mean, that’s how it is, right? You learn and you tweak, and you change, and you move.”**

Moushumi Mohanty, head of the Electric Mobility Programme at the Centre for Science and Environment (CSE)



Indian state of Tamil Nadu. The “Future Factory” will have the capacity to produce ten million electric scooters a year. Meanwhile, Bajaj Auto, a leading manufacturer of both two- and three-wheeled models, has pledged to invest almost 134 million USD, ramping up production via an expansion of its Pune factory. In August 2021, TVS, India’s third-largest two-wheeler manufacturer, announced that it would spend the same amount launching a new product line of electric bikes.

States are utilizing their powers to fuel the transition, too. In January, the Delhi government announced rules to ensure that 50 per cent of new two-wheelers and 50 per

cent of new cars working for app-based delivery and cab services are electric by March 2023.

**However, many of** these expansions hinge on the ability of manufacturers to gain better access to batteries. For manufacturers, access to raw materials can be difficult and 30 to 40 per cent of these materials are not sourced locally, according to the CSE. Plus, the high cost and intensive R&D needed for cell development makes the ability to scale up cell production imperative if it is to become viable.

That is the downside to focusing on two- and three-wheelers, which require only small batteries – around 4 kWh for two-wheelers

## Moushumi Mohanty

**Lives:** Gurugram, National Capital Region of Delhi, India

**Occupation:** Head of the Electric Mobility Programme at the Centre for Science and Environment

### What keeps you motivated:

My husband has asthma, and we’ve noticed that whenever we are on holiday in Kerala where the air is cleaner, he doesn’t use his inhaler as much as he does here. That’s something I see day in and day out happening in front of me. That’s my personal context to the India EV story.

**Hobbies:** I love gardening, reading and cooking.



**“There have been some big commitments made to developing charging infrastructure and clearly the numbers have to be much larger, but India is working on it.”**

Moushumi Mohanty, head of the Electric Mobility Programme at the Centre for Science and Environment (CSE)

million cars each year in India and Mohanty says that switching the starter battery from lead acid to lithium (integral to EV batteries) would generate that scale quickly.

“If you do that, you will immediately create the pool of demand for these batteries,” she says. “Once that happens, a lot of other parameters will fall into place.”

It is one of numerous suggestions Mohanty has brought to policymakers tasked with meeting both the ambitious EV adoption and supply side targets under production-linked incentives. Despite the scale of the task and the various gaps in policy, Mohanty is optimistic that the EV revolution remains on track. She led a workshop at the CSE think-tank in March 2022, with various Indian states in attendance, where the aim was to form more detailed plans to successfully navigate the transition.

The Indian states recognize “there is this job to be done,” says Mohanty. “India has started on this journey, and it is not going to be a linear path. It will be back and forth, back, and forth. I mean, that’s how it is, right? You learn and you tweak, and you change, and you move.” ■

or 7 kWh for three-wheelers. Four-wheeled EV batteries can range anywhere from 20 kWh to 100 kWh, so manufacturing an equivalent number of four-wheeled vehicles to two- and three-wheelers could unlock the large scale required to make mass production feasible.

“Demand for four-wheelers means a requirement for larger batteries, which in turn creates a case for battery manufacturing,” says Mohanty. “Let’s be honest, this is a volume game, and we need much larger volumes for battery manufacturers to be able to achieve scale at some point.”

And yet there may be innovative methods to navigate these hurdles. People buy between three and four

## India’s EV revolution in numbers

**30%**

The government is targeting 30 per cent of total vehicle sales to be electric by 2030

**0.15%**

The current market share of electric two-wheelers

**46%**

The annual growth rate in EV sales required to meet the government’s EV adoption target

**134,844**

Electric vehicle registrations in India during 2021

**113 km**

The distance YC Electric’s Yatri Super rickshaw can travel on a single charge; among the furthest on the market

**1.5 billion USD**

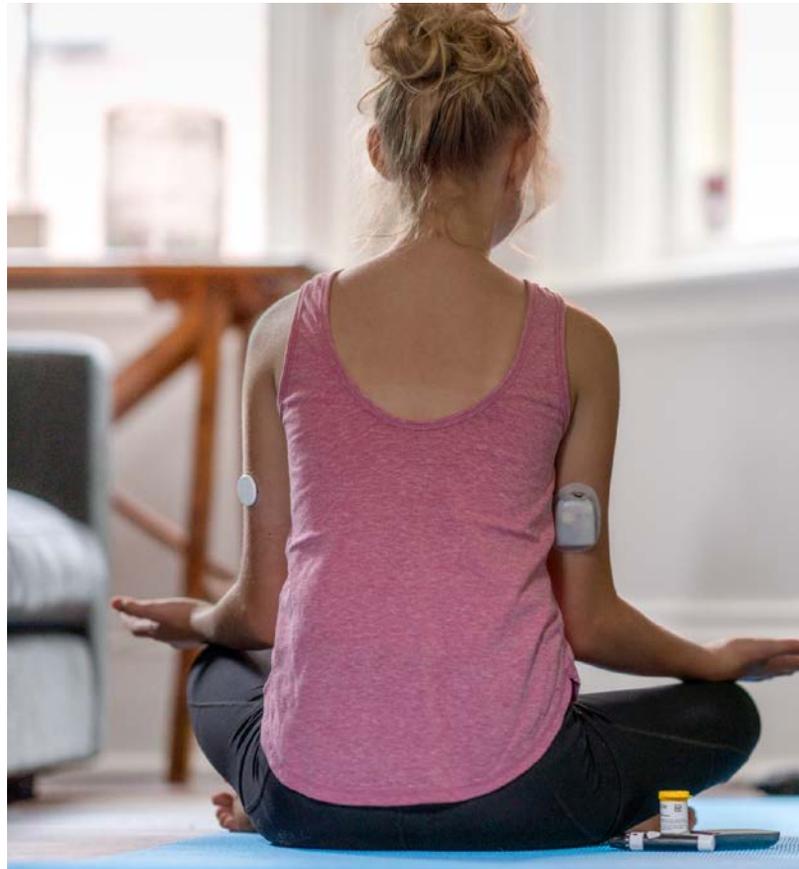
The value of the second phase of the Indian government’s Faster Adoption and Manufacturing of Hybrid and Electric vehicle (FAME) subsidy scheme, aimed at speeding up the adoption of electric vehicles

Sources: The CSE, Ministry of Road Transport & Highways, Government of India, Ministry of Heavy Industries, Government of India.

# Wearable medication

“The market for wearable medical devices is expanding rapidly. All that’s required to turn existing research into the next miracle device is someone with the ability to connect the dots,” says Ursula Nollenberger, Global Product Line Director for Trelleborg’s healthcare and medical solutions.

TEXT PATRICK GOWER



**W**earable medical devices are ushering in a future where patient’s diagnosis is more accurate, they can receive tailored treatment when it matters most, and have continuous monitoring of their condition; all with fewer visits to a doctor.

That is why the global wearable medical device market size is projected to grow to 56.6 billion USD by 2030, from 17.4 billion USD in 2020, at a compound annual growth rate of 19.5 percent, according to Market Watch.

Technically, wearable medical devices are nothing new – consumers have been wearing nicotine patches since the 1980s – but a new generation of smart wearables is emerging, including implantable devices, which not only treat a condition but gather huge amounts of health data as well. These devices provide a reliable means of drug

therapy without requiring administration by trained personnel and at the same time use sensors to allow doctors to monitor vital signs and parameters such as glucose levels and physical activities in real time.

Wearable devices “enable a more patient-centric approach to diagnostics and therapies versus the way it was done before, where you’d go to the doctor’s office, get a diagnosis, then a prescription,” says Nollenberger. Often these devices “are collecting data in real time, not once a month or however often you go to the doctor. That means earlier diagnoses and more preventative measures that lower overall healthcare costs.”

**The technology for wearables** is developing rapidly, resulting in designs that are increasingly complex. Manufacturers are challenged to produce devices and components that are implantable and can fit into

## How it works – automated dosing of insulin

Modern diabetes care encompasses fully automated, real-time continuous glucose monitoring (CGM) via wearable or implantable devices combined with a smart insulin pump system.

Palm-sized devices attach directly to a patient’s skin with an adhesive patch. Connected to the pump of the device is an extremely fine needle port that extends automatically to inject a pre-programmed quantity of medicine with no input from the user.

Precise control regulates delivery of as little as a few microliters of an active ingredient over a period of time tailored to the particular patient need. This improves the quality of life of diabetics, making delivery of medication flexible and worry-free.



PHOTO: ISTOCKPHOTO

## “Wearable devices enable a more patient-centric approach to diagnostics and therapies.”

Ursula Nollenberger, Trelleborg



a 5 mm<sup>3</sup> space with a weight of less than 0.02 grams. Drug delivery is also moving through a period of rapid development. Many drugs are being incorporated into small, silicone-based delivery devices, which can release a drug directly with fewer side-effects.

**These devices must** tick a lot of boxes. Demand is soaring for biocompatible, implantable and biore-sorbable material solutions that have functionalities such as conductivity, tracing, adhesion, active pharmaceutical ingredient (API) absorption or lubricity. Wearables that meet the required thresholds must reflect patients’ needs, maximizing comfort and ease of mobility in daily life, all while being easy to use.

“The key to success is design,” says Nollenberger. “The best devices connect a brilliant idea with what’s possible. However, questions require answering; like how can the idea adapt to serial production, rather

than be just a one off? Is it scalable to high volume manufacturing? Is it affordable? Is it robust? And ultimately, does it best serve the purpose needed?”

Advances are not governed solely by what is possible. Regulatory hurdles are significant. Cyber security, for example, has become a point of contention. The relatively novel nature of the sector means the regulatory environment is shifting continually, with new demands governing everything from the biological risk of devices to control of standards for chemical substances. The stakes are high, says Nollenberger.

“If you’re wearing something that monitors your blood glucose levels, it has to function,” she adds. “People’s lives are at stake.”

Many obstacles can be overcome when device designers partner with experienced healthcare and medical component manufacturers early in the process. That way, early-stage designs can incorporate expert input on all aspects of the engineering and production process, including prototyping, product and process development, material selection, processing, toolmaking, quality, regulatory and validation planning, scale-up, and automation.

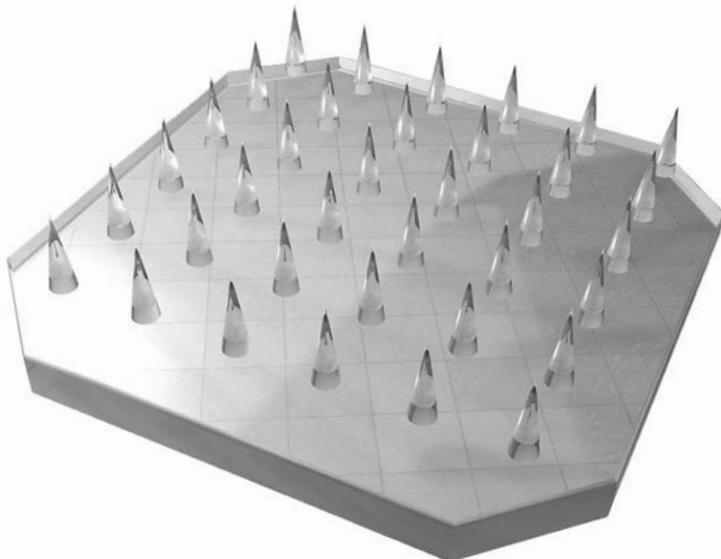
**With the right** partnerships in place, there is little to stop the proliferation of devices that will further improve patient diagnostics and therapeutics. The pace of change relies on the speed at which inventors can turn academic ideas into functional, scalable devices, according to Nollenberger.

“The research at an academic level is already there in many instances. It’s now a question of people taking that and applying it,” she adds. “Turning that research into usable devices is really about connecting the dots.” ■

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**Below:**

The typical Trelleborg microneedle patch is the size of a fingernail or smaller, but it could be any size and shape, depending on the type of drug and dose administered.



# Making the link

Work has begun on the Fehmarnbelt Fixed Link, the world's longest immersed tunnel. When completed, this priority EU transport infrastructure project will bring Scandinavia and Central Europe much closer to one another.

**TEXT** CARI SIMMONS  
**PHOTOS** MALOU VAN BREEVORT



PHOTO: TRELLEBORG

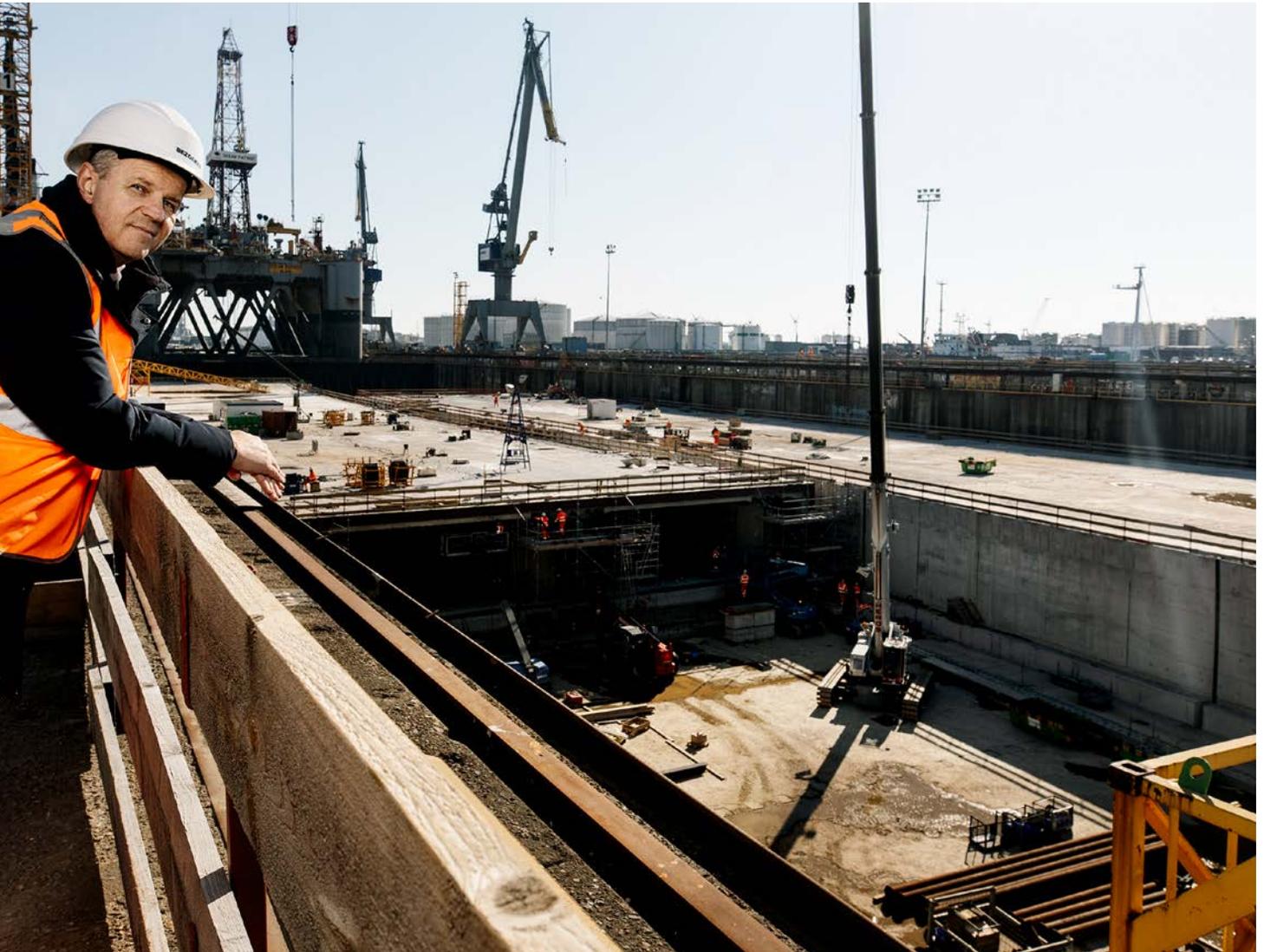
**Left:**  
The tunnel's sections are towed to site, sunk and linked together under water.

**Right:**  
The tunnel will reduce CO<sub>2</sub> emissions by offering a more direct transport route between Denmark and Germany.



**A massive infrastructure project** is underway that will provide a new transport corridor to connect Scandinavia and Central Europe in a greener, quicker way. Once completed, the 18-kilometer Fehmarn Belt Fixed Link will be the world's largest immersed tunnel. It is made up of sections built on land, that are floated and towed to the tunnel site, sunk into place and linked together.

The new tunnel will connect the Danish town of Rødbyhavn and the German island village of Puttgarden in an underwater journey through the Fehmarn Belt strait that will take just seven minutes



by train and ten minutes by car.

The immersed tunnel will also provide a more direct route for international trains, trucks, and vehicles, dramatically shortening today's 160-kilometer detour to cross the strait. It will also cut down on ferry traffic, with the tunnel's road and train passengers saving about an hour on the crossing. As a result, the new link will contribute to a reduction in CO<sub>2</sub> emissions.

Construction of the tunnel, which takes place on land and as deep as 50 meters undersea, began in 2020. In 2021, both Germany and Denmark began constructing the tunnel portals. The project involves



**“Part of the tunnel is built on loose Paleogene clay, which means we have to accommodate more ground movement and shifts without leakage.”**

Nicas van den Brink, Trelleborg

hundreds of sub-contractors and thousands of workers. Trelleborg has a contract with Femern Link Contractors (FLC) and is the sole supplier of sealing solutions.

Connecting Denmark and Germany underwater is no easy feat and requires a massive number of components and materials. For instance, an entire manufacturing facility was built just to produce the concrete for the tunnel.

**Trelleborg, which has** played a role in many other immersed tunnel projects, understands the challenges that come with such infrastructure. The company will supply its

## World's longest immersed tunnel

**What?** Fehmarnbelt Fixed Link tunnel is an 18-kilometer-long immersed tunnel.

**Where?** It will connect the Danish island of Lolland with the German island of Fehmarn, crossing the Fehmarn Belt in the Baltic Sea.

**Why?** The tunnel will reduce travel time by car from 45 minutes to seven minutes compared with traveling by ferry and will reduce CO<sub>2</sub> emissions by offering a more direct transportation route.

**When?** Expected to be complete in 2029.



PHOTO: TRELLEBORG

## “We have a tight building schedule and can’t afford any delay.”

Rene Fredriks, Trelleborg

waterstops for waterproof tunnel elements, portals and ramps, as well as 89 Gina gaskets and 89 Omega seals for the permanent immersion joints that connect the tunnel elements. All of these solutions mean the tunnel will be able to withstand movement, while also remaining waterproof.

Every immersed tunnel project comes with its own set of challenges and the Fehmarnbelt project is no exception. Trelleborg Design Engineer, Nicas van den Brink, says the soil type and sea depth in the area require tailormade solutions.

“Part of the tunnel is built on loose Paleogene clay, which means we have to accommodate more ground movement and shifts without leakage. We are providing the

largest immersible Gina gaskets ever produced, and our design must withstand water pressure at the deepest point of the tunnel, as well as expand in summer and retract in winter,” he says.

“We have also developed and patented a waterstop with a new injection system for the client to cope with the dynamic behavior of the structure. And, to receive approval for this project, mitigating measures were taken not to affect the existing natural ecosystem.”

**The Fehmarnbelt tunnel** is a high-profile project that will take many years to complete. Trelleborg is providing a dedicated support team and on-site personnel throughout the entire project lifecycle to ensure

### Above:

The 18-kilometer journey under the Fehmarn Belt will take ten minutes by car and seven minutes by train.

on-time and on-budget delivery: from consultation, engineering design and full-scale testing to aftersales service.

“We have a tight building schedule and can’t afford any delay,” says Rene Fredriks, Managing Director for infrastructure solutions at Trelleborg, adding that the Gina gaskets and Omega seals will be produced in multiple locations to ensure continuity of supply.

“We are extremely proud to be part of such a prestigious project. It’s the biggest and most elaborate infrastructure project for Trelleborg,” he says. ■

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**Rene Fredriks,**  
Managing Director  
for Trelleborg's  
infrastructure  
solutions.

# Protecting the essential

OPERATIONS

COMPLIANCE



SOCIAL  
ENGAGEMENT



## PROTECTING THE ESSENTIAL

Protecting the essential is about minimizing our negative impacts and maximizing our positive impacts, making sustainable changes vital for the planet and for society. Our focus areas stretch from the environment to health and safety; from compliance to ethical relations with all our stakeholders and society as a whole. While considering the big picture, we also need to focus on areas where we can make a genuine difference.