

ttime

A MAGAZINE FROM TRELLEBORG GROUP

1-2023

Solutions that seal, damp and protect critical applications.

Close-up on semiconductors

An increasing need boosts microchip demand

PLUS

WHY E-MOBILITY HAS
A BRIGHT FUTURE

AN INNOVATIVE
MATERIAL THAT FIGHTS
PRESSURE ULCERS

SEAL PREVENTS LEAKS
IN RAILWAY TANKS

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EDITORIAL

THE SMALL DETAILS

The semiconductor shortage during and after the Covid-19 pandemic affected not just industry but also the consuming public around the world. In this issue of *T-Time*, we find out what semiconductors are, why they are so important to today's society and how Trelleborg's super clean seals contribute to their manufacture.

One area in which semiconductors are important components is the automotive industry. In this issue, Trelleborg's automotive expert talks about the future for electric cars and the range anxiety facing the industry, as well as about vehicles that are powered by hydrogen.

Trelleborg also provides critical materials

for the healthcare & medical industry. In patient care, the textiles that cover beds can protect against pressure ulcers. Here Trelleborg has a role to play and we are proud of our polyurethane-coated fabrics that prevent pressure ulcers. Read more about these great products and many more in *T-Time*.

Enjoy your reading!

Peter Nilsson,
President and CEO



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SweetBunFactory/Adobe Stock
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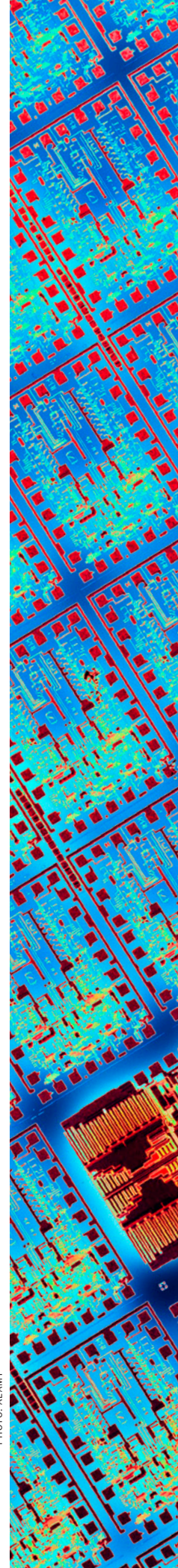
Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way. The Trelleborg Group had annual sales of about SEK 30 billion (EUR 2.83 billion, USD 2.98 billion) in 2022 and operations in about 40 countries.

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

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TRELLEBORG

PHOTO: ALAMY



Chips with everything

Microchips make the world go round, and the need for the semiconductors that make up these chips is increasing exponentially. In parallel, semiconductor features are miniaturized and made more powerful to satisfy the demand for smaller, faster and higher performing devices.

TEXT DONNA GUINIVAN ▶

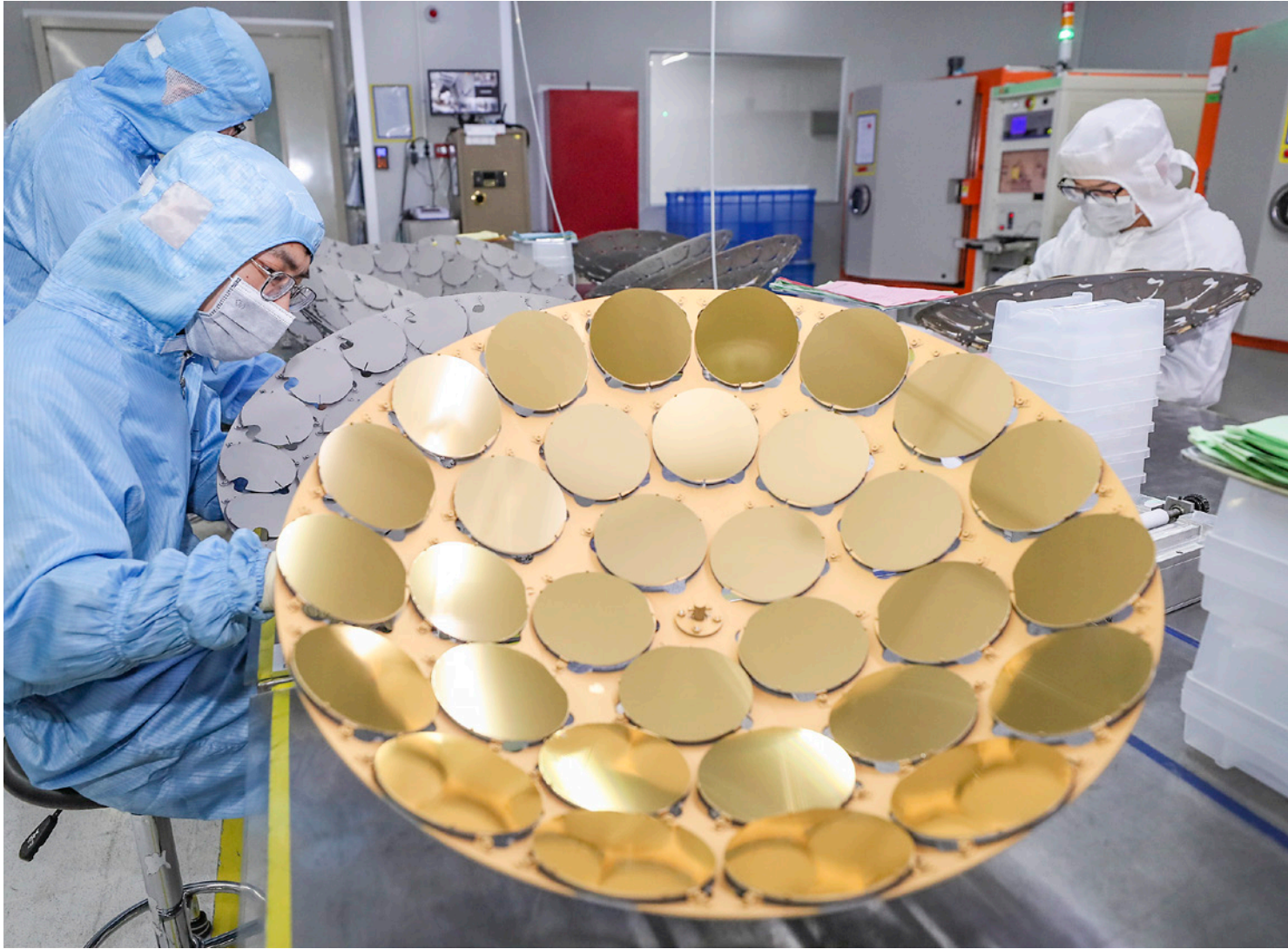


PHOTO: GETTY IMAGES

These days virtually everything contains semiconductors,” says Dr. Murat Gulcur, Material Development Manager for semiconductors at Trelleborg. “The latest mobile phones have more computing power than big computers of 10 to 15 years ago, maybe even five years ago. We take what’s inside them for granted. We never really think about what is behind our ability to upload a high-resolution photo to social media in less than a second, while millions of users are doing the same thing at the same time globally.

“If only 10 percent of all social media users upload just one image

Above:

The production line of LED epitaxial wafer at a facility in China.



Dr. Murat Gulcur, semiconductor expert, Trelleborg.

a day, imagine how much data needs to be processed and stored,” he continues. “Add email to that, which requires storing and backing up constantly. The amount of data is growing and growing, and in the background all of that is processed using semiconductors.”

The computing power of a microchip or integrated circuit is directly related to the number of transistors it has. Maximizing computing power means that more transistors need to fit on these devices.

“The technology behind semiconductors has evolved significantly over time, particularly around their miniaturization,” continues Gulcur.

Do you know the lingo?

Semiconductor: A type of material that has an electrical resistance adjustable from an insulator to a full conductor.

Semiconductor fab: A semiconductor fabrication plant or foundry.

Wafer: The base of all microchips or integrated circuits. A wafer is made of pure silicon crystal with embedded ions to give it semiconductor characteristics.

Microchip or integrated circuit: These are almost the same thing – a bundle of semiconductor devices that consist of multiple circuitry elements.

Feature or node size: The feature or node size is the definition of a semiconductor device size. The smaller the feature size, the more advanced the microchip.

Transistor: A semiconductor circuitry element that switches or amplifies an electrical signal. In computers, transistors are mostly used as switches. Transistor arrays are used for storing data as memory and doing computation in binary mode.



Left: Pure silicon crystal and wafers.

“In the very first integrated circuit, there were only 16 transistors with a feature size of 40 micrometers or 40,000 nanometers – about half the width of a human hair.” Gulcur explains that the term “feature size” refers to the size of the elements on a semiconductor.

In 1965, Gordon Moore, co-founder of Intel, said that the number of transistors that would fit on a given area of silicon would double every two years. A few years later he revised his statement, which is now known as Moore’s Law, and said that the number of transistors per integrated chip would double every 18 to 24 months – an astonishing prediction that proved true.

Right: The most advanced technology node is down to five nanometers.

If a human hair was the size of England’s international soccer stadium in Wembley, which has a capacity of 90,000 spectators, the five-nanometer feature size on a semiconductor would be the size of just one of those spectators.



PHOTO: GETTY IMAGES

Today’s integrated circuits have billions of transistors, and the manufacturing process is at the nanoscale. The most advanced technology node, or feature size, as of today is down to five nanometers. That is five one-billionths of a meter.

“Moore’s Law has applied up until recently,” says Gulcur, “but in the near future maybe we will finally see the number of transistors in an integrated circuit slowing down. That’s because we are stuck, as the feature sizes are now approaching the physical limits of the space of a semiconductor, and we can fit no more transistors on a chip’s two-dimensional surface.”

However, processing power and data transfer speed need to increase further. It is not only required for the devices that we can see and handle but also for recently emerging critical trends that need huge storage and processing capacity, such as autonomous driving, Artificial Intelligence, big data, the Cloud and the Internet of Things.

“Semiconductor engineers are increasing processing power by creating complex architecture in three dimensions to fit more transistors in a unit area,” explains Gulcur. “We are going beyond the realms of traditional physics into quantum physics and mechanics, and the design rules are changing.”

Microchips are manufactured in semiconductor fabrication plants,

“Until they are ready to ship, our parts never leave the cleanroom and are specially packaged after an intensive cleaning process.”

Dr. Murat Gulcur, Trelleborg

which are essentially giant cleanrooms with extremely expensive and specialized production equipment. Much of this equipment relies on critical sealing that can stand up to the particularly harsh conditions of fab processing.

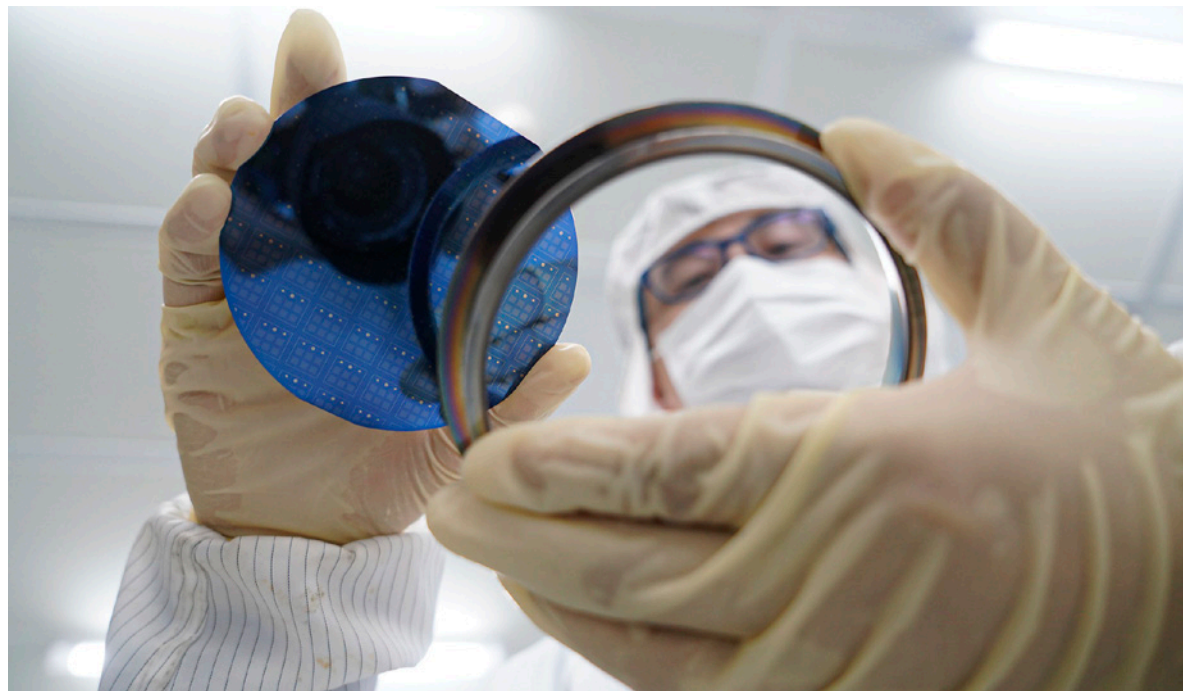
“Extending the life of seals is key to lengthening planned maintenance intervals,” says Gulcur. “This can reduce total cost of ownership in semiconductor fabs, but even more importantly it can optimize semiconductor wafer output. Every second counts on high-volume semiconductor production lines. Emergency downtime must be avoided and planned maintenance times minimized.”



PHOTO: ADOBE STOCK



Left:
Clean manufacturing. The operators are wearing sterile protective coveralls to ensure the quality of semi-conductors.



Right:
A wafer arrayed with carbon nanotubes (CNT).

“The technology behind semiconductors has evolved significantly over time, particularly around their miniaturization.”

Murat Gulcur, Trelleborg

At the nanometer scale, air is extremely dirty. In production, everything that is involved in microchip manufacturing, including seals, must be as clean as possible so that no particles enter the semiconductor manufacturing process from outside.

“Particles not visible to the naked eye can lead to defects on semiconductor wafers,” says Gulcur. “It is paramount that seals within semiconductor manufacturing equipment are super clean on delivery to avoid damage to minute electronic components, causing so-called killer defects. Our seals for semiconductor fabrication are therefore manufactured in cleanrooms, from

raw material to end product. Until they are ready to ship, our parts never leave the cleanroom and are specially packaged after an intensive cleaning process. This helps our customers increase yields.”

Seals also need to perform effectively in all process steps involved in semiconductor production, and that is more challenging as the process steps increase and process conditions become harsher in fabs.

“Now there are a larger number of process steps to make a microchip,” says Gulcur. “For example, when feature sizes were 28 nanometers, there were about 400 process steps. For a five-nanometer

feature size there are thousands, despite advanced extreme ultraviolet [EUV] lithography in high-end semiconductor manufacturing.

“Every process step must take place in a cleanroom,” he says. “Our cleanrooms are clean; at ISO 5/Class 100, we’ll have a maximum of 100,000 particles larger than 0.1 µm per cubic meter. The semiconductor manufacturers’ cleanrooms are ISO 1, which is 10,000 times cleaner than ours.

“Our seals are in a continual development cycle,” he says. “As the industry changes to meet ever-increasing demands for processing power and volume, the challenges for both the microchip manufacturers and us increase.

“Specialist materials that once operated perfectly well are taken to their limits, and we need to develop the next generation of even better materials. To continue to fulfill the requirements of semiconductor equipment manufacturers, we must be continuously alert, not just to keep up with the trends but also to anticipate them and how they will impact our products. We need to be ready to take action.” ■



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These things contain microchips

- Talking teddy bears
- Self-ordering fridges
- Diabetic monitors
- Identification implants for dogs
- Credit cards
- Singing greeting cards
- Security tags
- Car keys

NEWS



Trelleborg acquires US polymer giant

Trelleborg has acquired Minnesota Rubber & Plastics, a leading manufacturer of polymer and thermoplastic components, in a 950 million USD deal. The US-based company operates in several fast-growing industries such as medical equipment, water management and food & beverage. “This is a step change for Trelleborg Sealing Solutions,” says Peter Nilsson, President and CEO of Trelleborg Group. “The business area will be as strong in North America as its already established position in Europe.”

New food-safe seals

Trelleborg has launched a new sealing family of FoodPro® ethylene propylene diene rubber (EPDM) materials, which promises to revolutionize food safety. The FoodPro range is compliant with the most comprehensive global food contact material regulations and is specifically engineered for use in food and beverage processing applications.



PHOTO: TRELLEBORG



Getting a grip on fitness

One of Trelleborg's more unusual partnerships is with US-based fitness equipment company, Victory Grips. The company, run by ex-gymnast and former US marine, Victor Pellegrino, manufactures grips that are used to protect the hands and increase hold in various fitness applications.

Part of the reason that Victory Grips' products stand out is that the company uses technology developed by Trelleborg at its facility in Rutherfordton, North Carolina. This includes chlorosulfonated polyethylene rubber on Kevlar®, which provides superior strength while significantly reducing slippage.

PHOTO: TRELLEBORG

SUPERCHARGING THE FUTURE

Sales of electric vehicles are rising quickly, but could the industry become a victim of its own success? Trelleborg's e-mobility expert, Axel Weimann, tells us about superchargers, hydrogen trucks and why he is selling his combustion engine car to go all-electric.

TEXT PATRICK GOWER PHOTOS JEAN-CLAUDE WINKLER

Pick any data point and the growth of electric cars looks like a wildly successful phenomenon.

The number of electric cars on the world's roads hit 16.5 million at the end of 2021, according to the International Energy Agency (IEA). That is triple the number in 2018. Two million electric cars were sold in the first quarter of 2022 alone, three quarters more than the same period a year earlier.

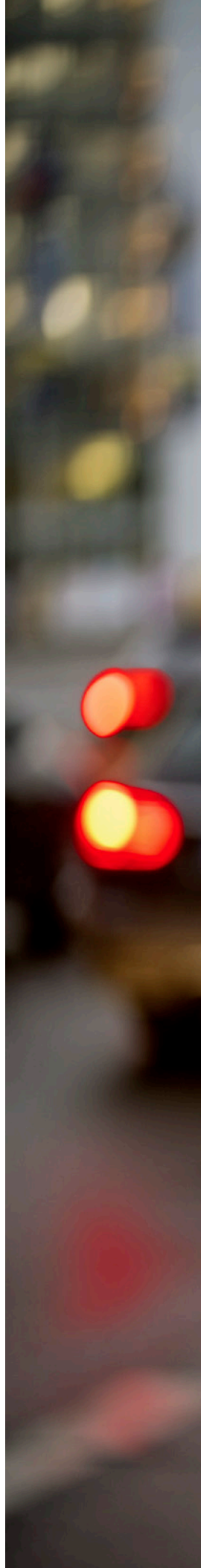
Yet with such a rapid rate of growth come challenges. The price of critical minerals essential for battery manufacturing are soaring. Lithium prices, for example, the IEA said were seven times higher in May 2022 than they were at the beginning of 2022.

The expansion of charging infrastructure in many locations has

failed to keep up with the growth in electric car sales, prompting hesitancy among potential buyers. Anxiety over the range of electric vehicles regularly crops up in consumer surveys, despite the industry's best efforts to publicize how this has extended.

"People who are yet to experience owning an electric vehicle naturally see potential obstacles, not the solutions," says Axel Weimann, whose passion and work is the future of automotive. "That concern is going to be blown away by some of the technological improvements we're going to see over the coming years."

Weimann is Trelleborg's e-mobility expert and would be what is considered an early adopter. He purchased his first electric vehicle, a Nissan Leaf, in 2015 – back



Axel Weimann

Job: Regional Director Automotive Europe, and Director, Global Segment Automotive, Trucks & Transportation at Trelleborg.

Lives: In Stuttgart, Germany.

Family: Wife, three children and a dog.

Car passion: Studied aerospace engineering after becoming inspired reading science fiction books as a teenager. "I was interested in the technology itself rather than the idea of being an astronaut. But then after receiving my driver's license and the feeling of being out in the car switched my focus toward the technological side of the automotive industry."

Axel Weimann predicts huge technological improvements within e-mobility over the coming years.



when global electric vehicle (EV) sales were running at a little over half a million a year. The average electric car had a range of about 100 kilometers in winter, about a third of that of modern comparable electric cars. “It was great as a second car,” he says. Weimann replaced the Nissan with a Renault Zoe when it was time to upgrade, another EV with greater efficiency and a longer range.

However, for many would-be buyers, questions over range and efficiency are only part of the picture. They focus on more mundane issues, such as where to charge an EV when living in an apartment block. That, according to Weimann, is becoming a redundant question. Employers across Europe are investing in charging infrastructure and gas stations are pivoting with installations of superchargers that can fuel 250 kilometers of range in just 25 minutes.

“If you drive up to 250 kilometers per week, then you don’t need a charger at home. You can charge while you buy groceries or pop out for coffee with a friend,” he adds.

PHOTO: TRELLEBORG



Flame resistant. Part of Trelleborg’s material range, FRV is a lightweight and ultra-flexible material used in EV-battery boxes.

“A change of mindset is required to see the opportunity of charging while parked and doing something meaningful rather than taking the extra ride to the filling station.”

The growth of EVs will place unprecedented demand on the national grid. To drive 100 miles, an EV uses the same amount of electricity as it does to power a typical US home for a day, according to the US Department of Energy. Yet, while EVs place significant demands on the grid, they can also be part of the solution, Weimann says.

Smart charging technology known as “vehicle to grid” enables car batteries to give power back to the grid, taking some pressure off when demand is greatest.

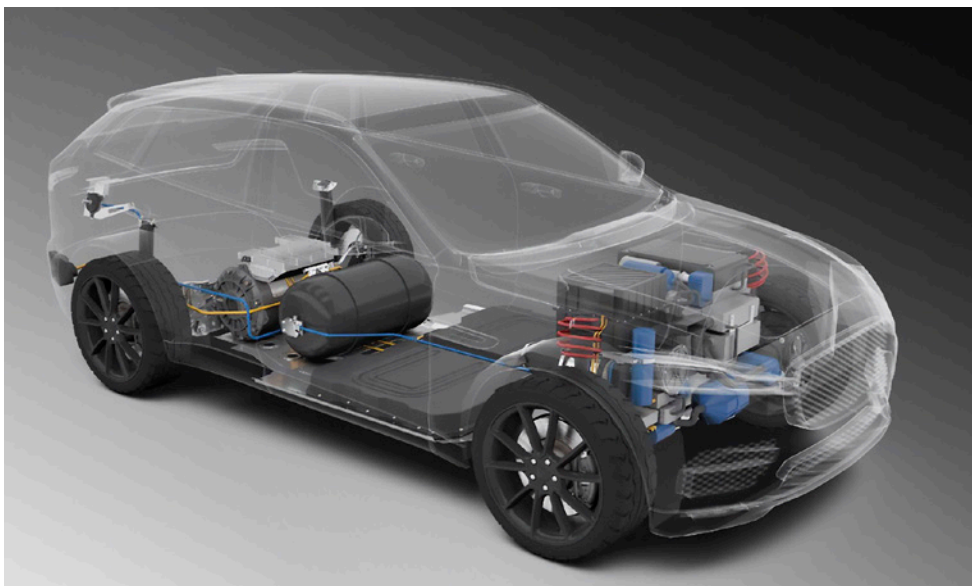
Plans to utilize the technology are already moving through the German parliament.

“This ‘breathing of energy’ is totally new and saves a huge amount of money on the grid because authorities don’t have to use their own storage capabilities,” explains Weimann. “You can just use the fleet on the street.”

Battery technology is now so advanced that it dominates the attention of governments and manufacturers. However, Weimann says that hydrogen power is developing quickly and holds advantages over electric vehicles in certain contexts, particularly heavy trucks.

Batteries weighing as much as two tonnes would be required to power standard-sized trucks, compared to a hydrogen fuel load weighing a quarter of that. That would ultimately cost the operator 1.5 tonnes of payload, and that is before you consider the slim prospect of finding superchargers outside of developed western economies. Hydrogen trucks have a window of opportunity “for at least the next ten years”, Weimann says.

PHOTO: TRELLEBORG



Sealing solutions. The requirements for seal performance in an electric motor are generally higher than for seals in a combustion engine.



“The countries who are lacking in charging infrastructure are going to need help developing further.”

Axel Weimann, Trelleborg

That lack of infrastructure hints at the limitations facing e-mobility during the years ahead, and even points to a crisis for developing economies. Across China, the Americas and Western Europe, governments have set ambitious emissions reduction targets, which is fueling investment in infrastructure to support the growth of e-mobility.

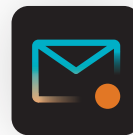
“Cars are built for huge markets,”

Weimann says. “The countries who are lacking in charging infrastructure, or who don’t have the power to switch, are going to need help developing further. Otherwise, it won’t be long until there are no longer new cars available to these markets.”

For now, manufacturers are focused on their domestic markets and it is working, but will everyone

Above:

Charging for the future. Axel Weimann will replace his sports car with a Tesla.

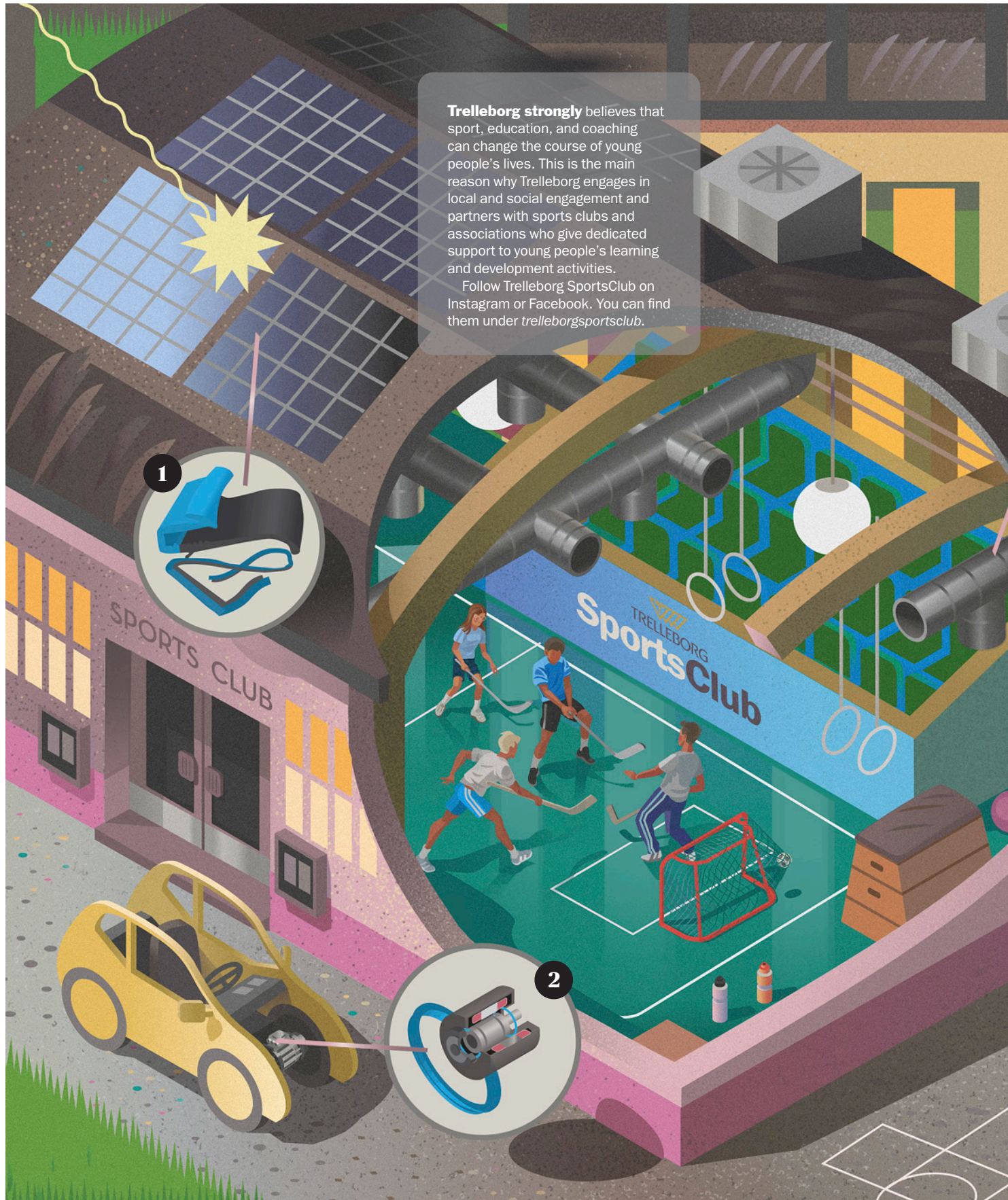


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be willing to switch to electric vehicles? Car enthusiasts tend to be romantic about combustion engines. Whether they can be converted is perhaps the truest test of electric cars as products. On that front, Weimann offers hope: he is selling his sports car to replace it with a Tesla.

“If you think about a v8-powered car with its sounds and just the special feeling it gives you, of course that’s fascinating, but times are changing and its time will soon be over,” he says. “But then I would say, if you have photovoltaic solar energy on the roof and you’re able to drive with your own power, that too is a special experience.” ■



Trelleborg strongly believes that sport, education, and coaching can change the course of young people's lives. This is the main reason why Trelleborg engages in local and social engagement and partners with sports clubs and associations who give dedicated support to young people's learning and development activities.

Follow Trelleborg SportsClub on Instagram or Facebook. You can find them under *trelleborgsportsclub*.



TEXT KARIN LARSSON
 ILLUSTRATION NILS-PETTER EKWALL

LIFELONG LEARNING

What is essential? No economy in the world can develop without having an educated society. It secures a good life and social development for individuals, and progress for countries. Trelleborg is present in the school environment, both with products and solutions in infrastructure and through its social engagement, which focuses on young people.

1. Solar panels

Sealing profiles in solar panels prevent dust and particles from entering the system and hold the glass in position.

2. Electric cars

The e-axis combines the electric motor and gearbox in a single unit. It presents a variety of sealing challenges to meet the goal of travelling the same distance as a gasoline vehicle on one charge.

3. Ventilation systems

The ventilation system involves the use of dampers with moving parts. These are dependent on seals to work efficiently.

4. Cable protection

Cable entry solutions are molded and certified to protect cables of vulnerable equipment, such as ventilation systems and solar panels.

5. Laptops

Semiconductors in laptops are highly sensitive components and the seals within the equipment that manufactures them must be super clean and demonstrate no particulation.

6. E-bikes

Seals perform several critical functions in e-bikes, in the batteries, sensors and drive systems. They must ensure electronic devices remain free of moisture and debris.



PHOTO: UNSPLASH

JAMIE'S MEAL MISSION

Through the years, school dinners have earned a reputation for being unhealthy and inedible. But in 2005, U.K. chef Jamie Oliver successfully campaigned to make the government legislate for schools to meet proper nutrition standards.

Learning by gaming

As digitalization keeps advancing, the idea of a gamification approach to learning is catching on. Many students in developed countries are so used to playing video games that educators are applying elements of game design to their classes to make lessons and the learning process more engaging and fun.



PHOTO: UNSPLASH

87

per cent is the current rate of global literacy, as reported in September 2022 by The World Bank. In 1820, the equivalent figure was just 12 percent.

United Nations Sustainable Development Goal 4.6 aims to ensure that all youth and a substantial proportion of adults achieve literacy and numeracy by 2030.

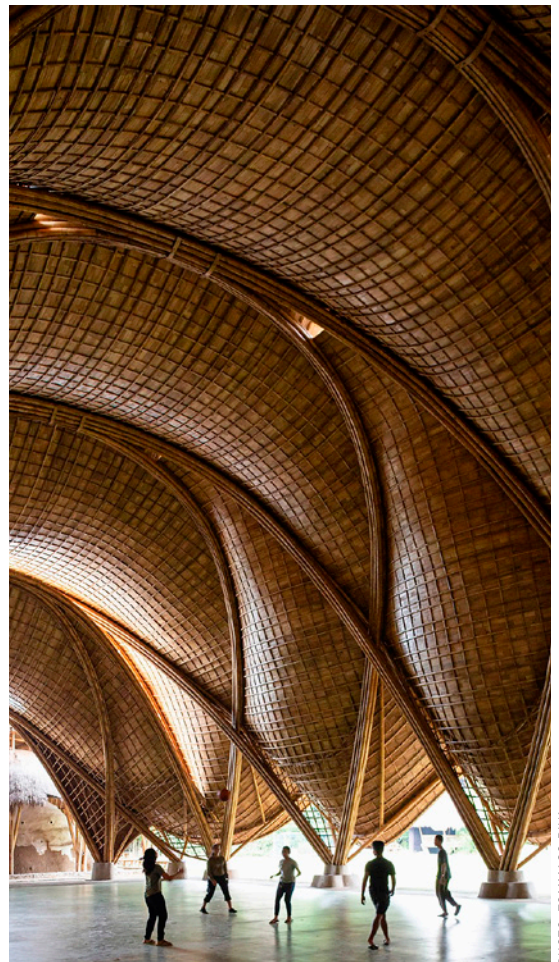


PHOTO: TOMMASO RIVA

INSPIRING SCHOOLS

Today a school is not only a place of education but also a sustainable and inspiring place in which to study. The Arc, a new bamboo-arch gymnasium at the Green School in Bali, was a winner in the 2021 Architecture MasterPrize.

TRANSFER TARGET

Beneath the unassuming appearance of a hose is unseen technology that is advancing all the time. A key driver for developments is the quest for global universality in food and beverage transfer.

TEXT DONNA GUINIVAN PHOTOS TRELLEBORG

Hoses may appear to be just long rubber cylinders, but beneath their plain outer coats are complex layers specifically engineered to make sure that beverages are safe and perfect to drink. Whether for fine cognac or fresh milk, hoses are critical to the transfer of fluids into, out of and around processing systems.

Below: Gerald Soulagnet, Material Development Manager for Trelleborg’s fluid handling solutions.

“Basic food and beverage hoses have three layers, with the most complex consisting of as many as 10 layers,” says Gerald Soulagnet, Material Development Manager for



Trelleborg's fluid handling solutions. "There is an inner layer that is in contact with the transfer media and an outer layer exposed to the external environment."

The inner layer, or tube, must be compatible with media going through hoses to avoid contamination and ensure organoleptic (odor and flavor) neutrality. Laboratory protocols monitor molecule release to select the best raw materials as well as process conditions.

The outer layer, or cover, needs to be robust, hard wearing, able to withstand weather conditions and resist oxidation. In some instances, the layer must ensure low friction for easy movement in food processing facilities and wineries.

"In between the tube and cover lie other layers of reinforcement, and these additional layers have various jobs to do," Soulagnet explains. "They may give added pressure resistance or more

Part of the changes

Being proactive, Trelleborg makes sure that it is involved in setting standards. Soulagnet represents Trelleborg at the European Tyre & Rubber Manufacturing Association (ETRMA) committee for the EU in Brussels, Belgium, which decides and modifies food and beverage standards in Europe. In France, he leads the French commission for food-contact materials. "We are not just facing the changes in the food and beverage processing market," Soulagnet says. "We are shaping them from the inside."



Left:
Hoses used for transfer in wineries.

flexibility and bendability. In certain applications, trucks may drive over hoses, and a strengthening layer can prevent the hose from collapsing. In other cases, we may want to add a functional barrier, for example, if there was diffusion of liquid inside the hose structure, we want to limit it to a certain thickness within the hose."

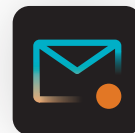
Any new hose development dedicated to food and beverages must follow strict regulations.

"Today, we see an increase in legal requirements globally," says Soulagnet. "Previously legislation for food and beverage production primarily came from Europe and America." Now all countries on all continents are issuing their own standards and requirements.

"We want to provide the safest product wherever it is used," he says. "That means integrating all requirements together, meeting them and exceeding them to future-proof our hoses."

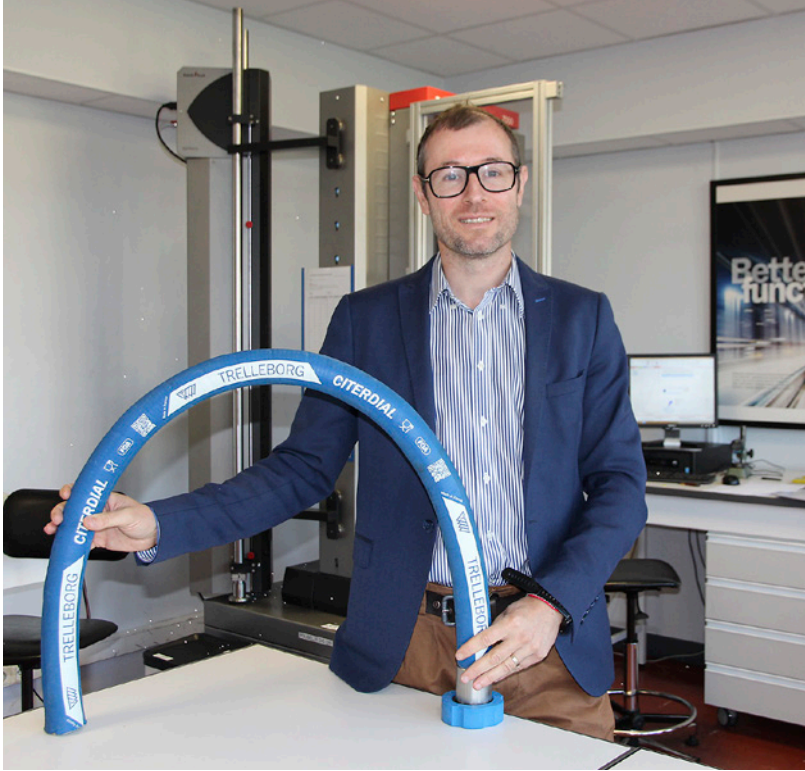
Rather than having specific hose ranges for each country, Trelleborg's strategy is to offer the market one range of hoses that meets the legislation and standards in all countries.

"If we can meet the European



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“Trelleborg is not just a global manufacturer of hoses but a solution provider.”

Gerald Soulagnet, Trelleborg

regulations, we can achieve the universality in hose specification that we seek,” says Soulagnet. “As long as we have well-positioned products, it makes our life easier when it comes to addressing our product to other markets. Just like us, if customers are global, they don’t want to produce different beverage processing equipment for different markets.”

Would over-specifying hoses for markets that have less demanding regulations increase costs in those markets? In Soulagnet’s view, the benefits of universality

Above:

Safety is vital when producing hoses, according to Gerald Soulagnet.

significantly outweigh any savings that could potentially be made from offering market-specific hoses.

“Standardization means reduction of our product range, which leads to simplifying and optimizing production planning and supply chain,” he says. “This applies not only to us but to our customers too.” Another consideration is that certification is costly and doing mass certification for all standards at one time for one product is cost-effective.

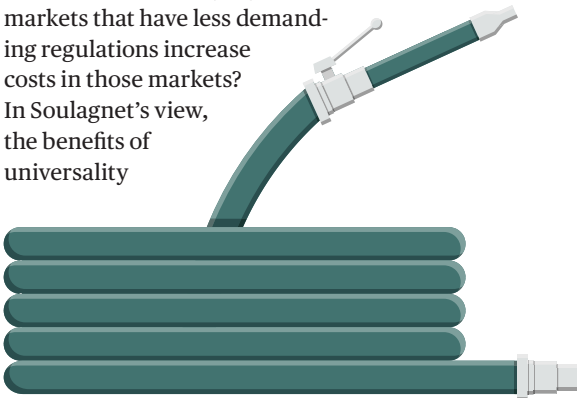
“Legislation is moving all the time, and those countries with lower specifications will eventually reach the same levels as those countries with the highest specifications,” Soulagnet points out. “After all, milk is milk wherever it is produced in the world, and ultimately the same regulations will be needed everywhere.”

In addition, sustainability is becoming increasingly important, both for Trelleborg’s customers and for the company itself. “We are now capable of developing material formulations for our hoses that include 80 percent natural ingredients and that are from renewable sources,” he says. “For other materials, using them as they come from their source means that we are not

using energy in modifying them. In addition, by focusing on the sustainability of production methods for our hose materials, we are reducing CO₂ emissions and energy consumption.”


In the future, Soulagnet sees customers expecting more than just hoses. They are demanding related services too. “Trelleborg is not just a global manufacturer of hoses but a solution provider,” Soulagnet says. “For instance, we offer assembly of hoses to a large range of couplings so hoses are ready to use on delivery. We have also developed an effective distribution network and our own service center to support customers.”

Recently approved is the construction of a cleanroom at the Trelleborg service center in Lyon, France, to fulfill the “ready to use” aspect of Trelleborg hoses. “Food producers have certain cleaning protocols they need to follow after receipt of hoses and before first use for food transfer,” says Soulagnet. “Our cleanroom solution will mean that we deliver clean, 100 percent traceable and certified hoses. This provides savings to the food producer by eliminating the initial cleaning step for the customer.” ■



Innovations continue

The food market is generally conservative, but innovation still plays a key role. In 2023, Trelleborg is targeting the launch of a rubber hose that will be compatible with all types of media, including fatty, high-alcohol, acidic and aqueous products and that will exhibit a very good chemical performance in cleaning media in temperatures up to 80°C.

A woman with long, wavy brown hair and a bright smile is crouching on a paved surface. She is wearing a long-sleeved top with bold, abstract stripes in blue, white, black, and red, paired with bright blue trousers and matching blue high-heeled shoes. Her hands are resting on a yellow and black striped road marking. The background is a blurred outdoor setting with a building and a railing.

On your marks and get ready for autonomous vehicles. Sarah Elsser predicts that they will be used more on highways than in cities.

The road to autonomous vehicles

It once belonged to the realms of science fiction, but now a future for autonomous cars is just around the corner. Technology expert Sarah Elsser explains more.

TEXT PATRICK GOWER PHOTOS RONNY BARTHEL

The January 1956 edition of *Life Magazine* carried an image of an autonomous vehicle that would resonate for decades.

It showed a family of four sitting in a car on a four-lane freeway, playing what seemed to be a game of dominoes. The father is in the driving seat, but his back is turned to the steering wheel. He is smiling at his son, who has just finished folding a paper aeroplane.

“We had just conquered the air, so we turned to dreaming of automating what we were doing on Earth,” says Sarah Elsser, a speaker, trainer and technology expert. “Autonomous vehicles are going to happen, although for the next few years they will only be suitable for use on highways. In cities, it’ll take much longer due to the sheer number of unpredictable factors.”

Elsser, who is the founder of the communications agency Tech Well Told, is a consultant for Trelleborg Sealing Solutions and has also worked with the likes of Volkswagen, Mercedes, Porsche, and Auto Bild. She believes that many manufacturers already have the technology to make *Life Magazine’s* dream a reality. In only a handful of years, she says, many consumers will have the chance to experience autonomous vehicles for themselves.

Automation is considered to have six levels, running (confusingly) from zero to five. Zero constitutes no autonomy, whereas five means fully autonomous with no driver input required at all. Manufacturers including Mercedes-Benz already have level 3 systems, able to navigate traffic, detect weather and merge lanes. Level 3 systems are not



“Normally Artificial Intelligence can only be as good as the algorithms somebody is programming, but unsupervised AI is a totally new approach.”

Sarah Elsser

without risks; you wouldn't want to play a game of dominoes in the middle of the freeway.

However, a level 4 vehicle needs no steering wheel. It will, within certain geographic confines, ferry humans from A to B with no supervision whatsoever. Alphabet's Waymo self-driving unit, formerly the Google self-driving car project, has already removed safety drivers from some of its autonomous

vehicles in San Francisco, in the US. This provides the clearest sign yet that, for small numbers, the 1950s image of autonomous driving is already here.

But Elsser says that moving the technology beyond level 4 will require a significant leap. Among the greatest challenges faced by operators is the difficulty in modelling so-called “x-factors” within heavily built-up areas like cities. For example, modelling a child running into the road presents its own unique challenges.

“The big vision of autonomous driving should be reduced to the idea of moving a car from A to B. It's for creating an autonomous and smart traffic ecosystem to reduce traffic jams, to massively lower the number of vehicles needed and to make it more accessible to disabled people,” says Elsser. “Cars must communicate with each other and

the whole infrastructure too, and progress is limited by the industry's reluctance to share data.”

She adds, “Everything must be connected if we really are to make a smooth, autonomous system, yet we're still struggling with data ownership. It's a real drag on progress.”

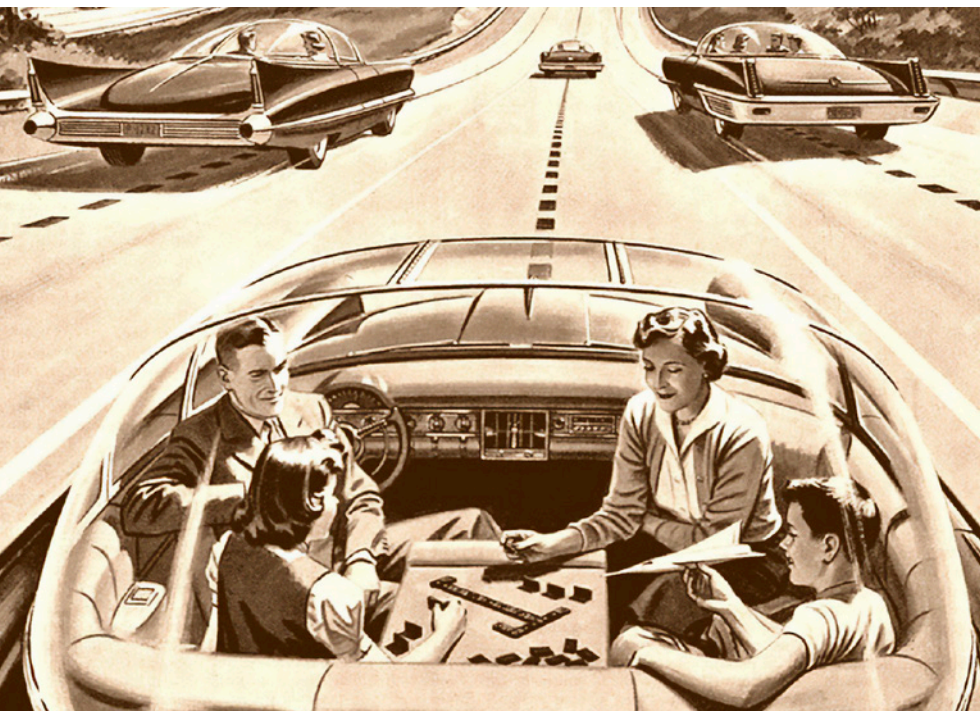
That lack of data sharing among private companies is among the biggest obstacles faced by governments seeking to transition to more sustainable transport systems in global cities. The lack of car-to-car communication is mirrored across transport networks, preventing the development of facilities that would enable consumers to make more efficient, sustainable choices.

“Everything should be possible within one app, from buying tickets to seeing if your train is delayed, to flagging a taxi or even knowing which journey is the more sustainable choice,” says Elsser. “The technology has been around some time, but too much of the data is locked in silos. People say data is the new oil, but actually it isn't – it's not about owning it, rather, it's much more about sharing and using it in a valuable way.”

Barcelona, Spain, offers reasons for hope. Francesca Bria, an innovation economist appointed by the city's Mayor, Ada Colau, has revolutionized the way the city uses data by ensuring private companies turned over what they had for the public good. She managed to persuade Vodafone to sign a contract, which saw it provide machine readable data to city hall. Bria's progress earned her the nickname “the Robin Hood of data.”

Similar schemes have taken place in Amsterdam, in the Netherlands, Helsinki, Finland and Brussels, where, under the Good Move plan, the municipal government of the

Below:
The future according to *Life Magazine* 1956.



© LIFE MAGAZINE VOLUME 40, NR 5, 1956, P. 8



Sarah Elsser

Lives: In Mainz, Germany, where she loves the food, the people and the culture. “It’s like a Mediterranean city in the middle of Germany.”

Occupation: Technology expert, speaker and trainer. Founder of the agency Tech Well Told. She calls herself a “nerd interpreter”: “They invent the technology that is to shape our future. And I want to make sure that this future belongs to all of us.”

Hobbies: She dances salsa, enjoys driving sports cars on racetracks or classic cars during rallies.

Belgian capital is building an app that enables travellers to transfer seamlessly between trains and buses, share bicycles or even charge e-scooters.

Some experts believe that feeding reams of data into algorithms is a step that can be skipped or even solved using machine learning. This is particularly the case when it comes to autonomous vehicles.

Elsser uses the example of Israeli start-up Autobrains, which employs what it calls “a new self-learning approach that mimics human driving perception”. The company raised USD 19 million in March, bringing its Series C funding round to USD 120 million. It has been backed by the likes of BMW and believes it can solve the so-called ‘X-factors’ in built-up areas – remember the child running

into the road – by parsing smaller amounts of data and learning from what is significant.

Should approaches like that of Autobrains find success, autonomous driving would only be limited by what humans are willing to accept. Elsser uses an example of the discomfort she felt when she first sat in a car that parked itself – “it felt unnatural, and that will take some getting over for a lot of people.” But she feels that it is just a matter of time, and from that point, it is difficult to really know where the possibilities end.

“Normally Artificial Intelligence (AI) can only be as good as the algorithms somebody is programming, but unsupervised AI is a totally new approach,” Elsser says. “We really don’t know how good it could be, and that’s really exciting.” ■

Above: Sarah Elsser is a technology expert, but she admits to feeling uncomfortable when she first sat in a car that parked itself.



Left: People who are confined to bed are prone to pressure ulcers.

Take the pressure off

Pressure ulcers are painful wounds to the skin and underlying tissue caused by long-term pressure to the skin. Advanced support surfaces are vital in their prevention.

TEXT ÅSA BEXELL HOFFMANN **PHOTOS** TRELLEBORG

Since pressure ulcers mostly affect people who are confined to bed or in a wheelchair for long periods of time, the design and materials of the surfaces they come in contact with are of the utmost importance. This is something on which the team at the Trelleborg facility in Nottingham, England, is an expert.

The company develops and manufactures engineered polyurethane-coated fabrics, specially developed for medical support surfaces. The polyurethane enables the textile to stretch in ways that allow a mattress or seat to redistribute pressure.

“The mattress or wheelchair cover is the point where skin meets fabric,” says Richard Haxby, Technical Director for Trelleborg’s support surface-fabrics. “The stretch properties of the fabric are vital in releasing the full potential of the support surface. If the fabric doesn’t conform to the contours of the patient, neither will the support surface.”

The fabrics are breathable, meaning the moisture produced by the patient can move through the textile. This helps to keep an individual’s skin cool and dry.

“The fabrics offer excellent abrasion resistance to withstand handling and hard wear, as well as resistance to damage from the aggressive cleaning agents that are used in hospitals and other care settings,” he says, adding that the textiles are also used in blood pressure cuffs, tourniquets, gowns, aprons and other medical equipment.

Equally important in suppressing the development of pressure ulcers is the core of the mattress or seat. The basic requirements are similar, but the emphasis can differ depending on the clinical needs of the patient.

“A wide range of materials are used in the core of a mattress, from basic slabs of foam to shaped foam, viscoelastic foam, gels and air bladders as manufactured by Trelleborg

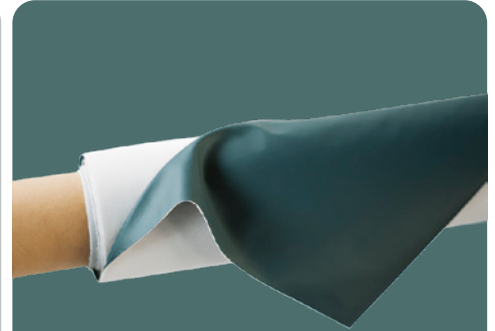


The future is now

Trelleborg has developed a mattress that incorporates knitted pressure sensors to allow continuous monitoring of a patient. The sensors tell caregivers when a patient needs to change position, whether the patient has moved on their own, and if there is high pressure on the patient’s skin. Linking of the sensor output to the control systems of a bed allow the bed’s configuration to change in response to the needs of the patient. Trelleborg is also developing sensors that can measure temperature and humidity.

What is polyurethane?

It’s an extremely versatile polymer that can be made into flexible or rigid foams, fibers, elastomers and surface coatings.



Recent developments

Trelleborg’s new, innovative manufacturing process, Zoned Coatings, enables coating with more than one polymer at a time. This means key physical properties can be varied across the width of a fabric without any joins or seams. The company is also launching Dartex Repel, shown above, a novel surface technology that creates a fast-acting antimicrobial surface without using any extra chemical additives.

in Monson, Massachusetts, in the US,” Haxby says. “Different materials bring different performance properties to a medical device.”

To understand the needs of the market and how to incorporate them into products, Trelleborg is actively engaged in the medical device industry. The company works with American and European committees on support surface standards, dedicated to improving the quality of life for the bedbound and wheelchair users.

One challenge with polyurethane chemistry is finding the perfect balance between breathability and durability. Improving moisture-vapor permeability has meant reducing the resistance to hospital cleaners.

“Working closely with our polymer suppliers, we have developed a new product that is both highly breathable and durable,” Haxby says.

The new product hit the market at the end of 2022. ■



Richard Haxby, Technical Director for Trelleborg’s support surfaces fabrics.



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Above: The stretchy polyurethane material in this mattress redistributes pressure.



Reducing dangerous leaks

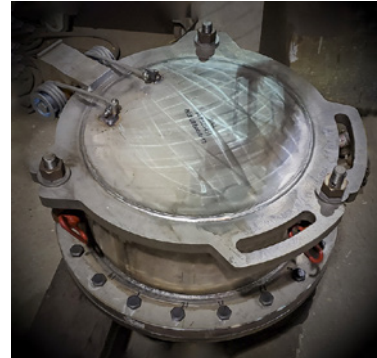
Union Tank Car Company's 3-Bolt Manway Cover seeks to simplify designs that have been little-changed for the best part of a century, while reducing leaks of hazardous materials.

TEXT PATRICK GOWER **PHOTOS** UTLX



Left:
A railway tank car with the manway on top.

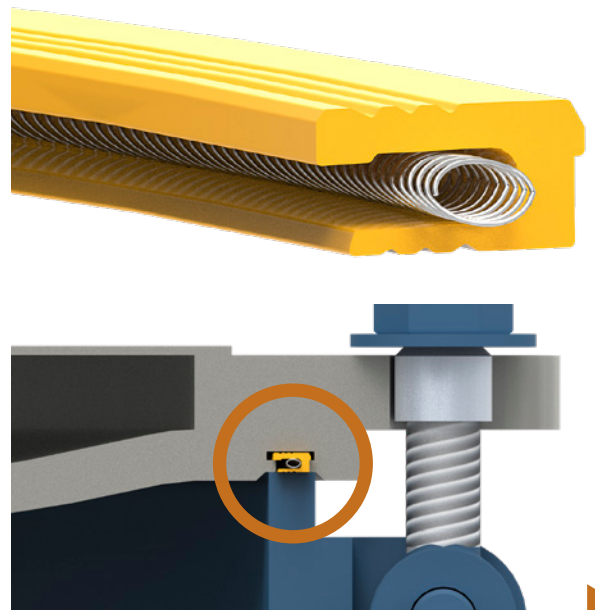
Below:
A prototype of a UTLX 3-Bolt Manway Cover.



Advanced sealing

Tank car manways require a seal that will ensure zero leakage over long journeys and withstand exposure to harsh chemicals in tough environments. The Trelleborg design team, in collaboration with Union Tank Car Company, met these criteria with the custom SEE® Variseal®, which features Trelleborg's proprietary Slantcoil® spring.

Below:
Details of the seal and slant coil in the UTLX 3-Bolt Manway Cover.



Almost every day in the US and Canada, there are instances of railroad tank cars spilling or leaking hazardous materials.

Spillages of hazardous material in transit are known in the industry as “non-accidental releases (NARS)” because they were not the result of a derailment or collision. Such spillages are usually caused by improperly secured or defective valves, fittings, and tank shells, according to the Association of American Railroads. There were 363 NARS from tank cars in 2019, according to the group’s most recent available data.

It’s a problem that Union Tank Car Company (UTLX), a railroad

tank car leasing, manufacturing and repair company, set out to solve several years ago. After numerous iterations engineers came up with a newly designed 3-Bolt Manway Cover. The new cover has a simpler torque pattern relative to more common 6 and 8-bolt designs, however the most important element is a unique seal, designed by UTLX in collaboration with Trelleborg.

“The design uses a spring energized elastomer seal that allows for the internal tank car pressure to help seal the manway, similar to old fashioned pressure cookers,” says Joe Perez, Vice President of Fleet Engineering at UTLX. “It is the first of its kind in our industry.”

“When you’re trying to bring in innovative ideas, right off the bat you’re running with something that’s going to take you a minimum of two years just to prove it.”

Joe Perez, Vice President of Fleet Engineering at UTLX



The design of hinged and bolted manway covers has remained largely unchanged throughout the century, yet has always been among the top-ranking sources of leaks. According to Perez, the industry takes precautions in testing and approval due to the risks of rolling out premature modifications, which means that design changes take time. UTLX maintained their focus over the years to evolve their concept and deliver an acceptable solution for the good of the tank car shipping community.

The design team, led by Dan Schmidt, Fleet Engineering Project Engineer at UTLX, simulated various design combinations using

finite element analysis (FEA), a computerized simulation that predicts how products react to forces, including heat, pressure and fluid flow.

“Initially we sought to incorporate lessons learned from prior UTLX design concepts and prototypes, including means to reduce complexity by using fewer than eight bolts, adding a metal-to-metal contact in the assembly between the manway cover and tank car nozzle, and exploring alternative sealing options beyond the standard flat gasket,” said Schmidt. “Central to these improvements was mitigating the primary cause of manway cover NARS, which was loose (or under-torqued) bolts.”

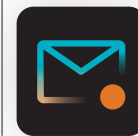
Reducing the number of bolts from eight to three simplifies the bolt torque pattern, improving functional and operational efficiency, and helps prevent the under-torquing of bolts and the over-stressing or crushing of the gasket.

So far, the new design has been successful. Regulatory approval requirements include pressurization of the seal to 1.25x that required

by regulations for a duration of ten minutes without evidence of leakage or stress. The 3-Bolt Manway Cover passed that test, and has now been approved for a two-year service trial, under which the product was operated in use on a select group of cars.

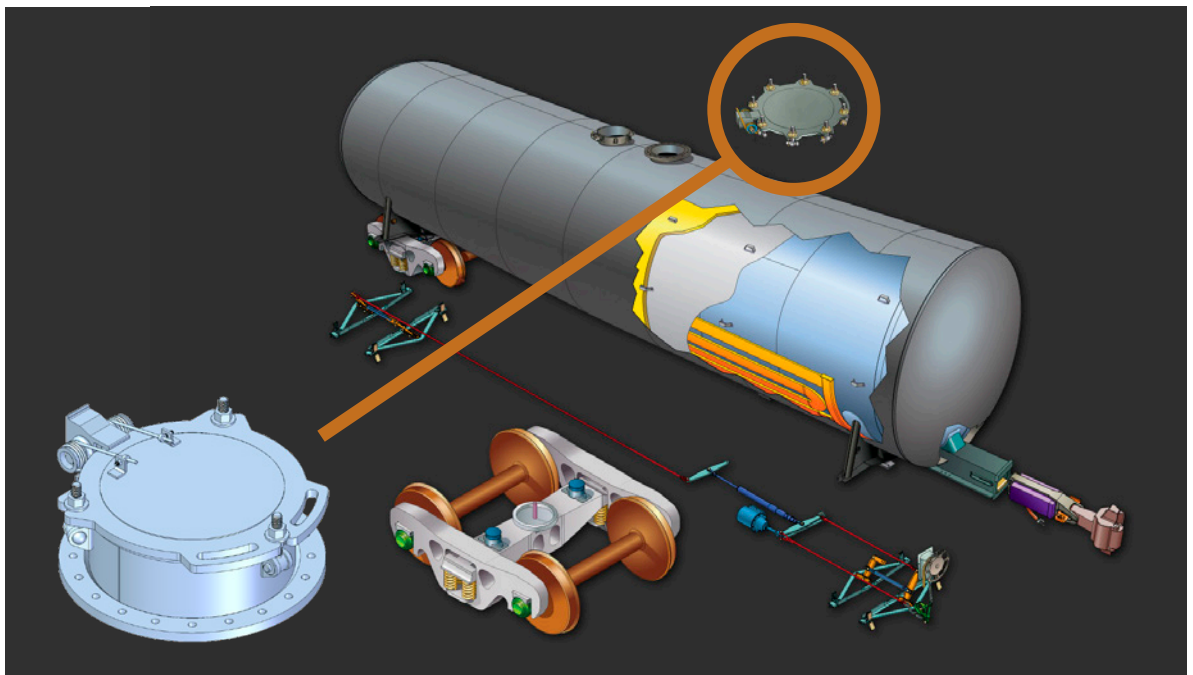
“When you’re trying to bring in innovative ideas, right off the bat you’re running with something that’s going to take you a minimum of two years just to prove it,” concludes Perez. “But in the long run we want this to become our standard design with it installed on a good proportion of our 100,000 tank cars, and we think many others will benefit from it, too. We’re bringing forward a new innovation that will help reduce the industrywide issue of NARS.”

UTLX expects that the new 3-Bolt Manway Cover will be generally available to the rail industry in 2024. ■



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Right:
The new 3-Bolt Manway Cover developed by UTLX.

NEWS



PHOTO: GETTY IMAGES

Sponsorship for higher education

In 2016, Trelleborg in India started a partnership with the nonprofit Akshaya Patra Foundation to provide scholarships for meritorious students from less wealthy economic backgrounds, giving especially girls a chance to become financially independent and gain employment.

Since then, Trelleborg has distributed over 1,300 scholarships to students, of which 1,000 were to girls. The students have pursued pre-university graduation or graduation courses in engineering, business administration, medical sciences, fashion designing, and fine arts.

10 YEARS!

The Trelleborg Group University Graduate program recently celebrated its 10th anniversary. The program has been a key feature of the Group's People Development strategy since it was founded. The program helps to realize Trelleborg's ambition to develop the leaders of tomorrow. Altogether, 285 talented participants from 24 countries have benefited from the 12 programs that have taken place.

Another deal sealed

Sealing solutions expert MG Silikon is yet another addition to the Trelleborg family. The German company, which specializes in sealing for aerospace applications, such as seals for airframes, windows, and cabins, and industrial applications, has annual sales of about 120 million SEK. The acquisition expands Trelleborg's silicone-based sealing solutions offering for cabin interiors and gives access to products such as injection molded seals for aircraft windows.



PHOTO: TRELLEBORG

PHOTO: TRELLEBORG



Biopharma boost

Trelleborg is expanding its manufacturing facility and BioPharma Center of Excellence in Northborough, in the US state of Massachusetts. The three-phase expansion project started in January 2023 and will take up to 18 months. Linda Muroski of Trelleborg says: "The investment is a key milestone in our global biopharmaceutical strategy and will enable us to expand our offerings to existing and new customers in the industry."

Pocket-sized and powerful

Trelleborg's next-generation marine positioning and piloting system, CAT PRO, empowers maritime pilots to be even more precise and efficient.

TEXT DANIEL DASEY PHOTOS TRELLEBORG

Skilled maritime pilots are among the most important professionals on today's waterways. Their work guiding vessels into ports and through congested and dangerous waters increases shipping efficiency, limits the potential for accidents and significantly reduces the need for dredging and its associated environmental impact.

In the past, pilots relied almost entirely on their personal knowledge of the waterways. Now, technology is transforming their working practices. Modern pilots

typically carry navigational-assistance hardware and software with them, which enhances their knowledge of current conditions.

Since 2016, Trelleborg has been a market leader in marine positioning and piloting systems, thanks to its SafePilot system.

Developed in Denmark, SafePilot works in combination with a ship's navigation system to provide the pilot precise information on the vessel's position, the tides, the bottom topography (the physical characteristics of the ocean floor) and any shipping hazards.

A new addition to the SafePilot

range, SafePilot CAT PRO, is setting the bar even higher, providing maritime pilots with vessel-independent GPS data and a host of other new features at an affordable price.

"The CAT PRO brings together many of the best features from across the SafePilot range into a package about the same size as two decks of playing cards," says Tommy Mikkelsen, Managing Director of Trelleborg's marine and infrastructure operation in Denmark. "It's lightweight and easy to use. We have pilots telling us our existing systems help them to work 25 percent more efficiently, and CAT PRO will further enhance accuracy, efficiency and safety."

Mikkelsen explains that when used with Trelleborg's navigation software SafePilot App, CAT PRO allows pilots to visualize the position of a vessel down to one centimeter in real time, giving

How SafePilot CAT PRO works

SafePilot CAT PRO is an advanced marine positioning and piloting system for daily use by maritime pilots. Each unit is about the size of two decks of playing cards and weighs 420 grams.

A pilot will typically carry two CAT PRO units along with a digital tablet when boarding a vessel that needs piloting. One unit calculates the exact position of the ship using GPS, while the other calculates the heading.

Using Trelleborg's navigation software, SafePilot App, the pilot views a live feed on the tablet and provides instructions to tugs to guide the vessel to its destination. The system launched in April 2022.

As well as systems for maritime pilots, the SafePilot range includes solutions for the offshore industry, tug operators, crane operators and ferry and cruise liner captains.



Right: Trelleborg's SafePilot CAT PRO, which consists of CAT PRO units and a tablet, contributes to safety on board.

extraordinary precision during piloting. Through close communication with tugs, guiding of vessels can be on the most efficient route to their destinations, cutting piloting time and helping to reduce turnaround time in port.

Shifting bottom topography and ongoing dredging are features of many waterways. CAT PRO provides pilots with clear images of the current state of the seafloor, reducing the risk of making contact. Advances in battery performance mean the CAT PRO will operate for 30 hours on a full charge, double the life of its predecessors.

A key feature of the CAT PRO is its ability to utilize multiple GPS systems to calculate a vessel's position, enhancing precision. "Previously, systems tracked the American and the Russian systems, GPS and the GLONASS," says Mikkelsen. "But CAT PRO uses every available system, including European, Indian and Chinese, to deliver accuracy down to one centimeter."

The system also includes new safeguards against potential external attacks. "One of the challenges with GPS systems is that they can be gamed or spoofed," says Mikkelsen. "Someone with ill intent can send out a signal that will trick a GPS unit into thinking that it's somewhere else. This could be catastrophic for a ship moving into a port. CAT PRO has the ability to detect this kind of activity and will notify the user."

Another key security feature is CAT PRO's ability to operate fully independent of the piloted ship, Mikkelsen explains. "Other systems tend to plug into the ship's instrumentation, and you also receive data from the GPS," he says. "So, it's a mix of ship and independent data sources. The CAT PRO is different. It's fully independent of the ship. So, if something goes wrong with the ship and it experiences a blackout or the engine goes dead,

the pilot can still keep control of the system. They can talk to the tug operators to navigate the ship into a safe location."

Another benefit of the system is that CAT PRO units are interchangeable. A pilot will typically take two units along with them when boarding a vessel – one for calculating the position of the vessel and the other for its heading, the compass direction in which the craft's bow or nose is pointed. "With all other systems, these two units are different," says Mikkelsen. "We have made the two units the same. The advantages of

this are that you can charge one unit inside while you use the other one outside and from a maintenance and repair perspective, you can mix and match them."

In the future, Mikkelsen expects the SafePilot range to continue embracing new technologies to deliver even greater convenience and practicality to its users. ■



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Below: SafePilot works in combination with a ship's navigations system and the new CAT PRO provides vessel-independent GPS data.



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.