t-time

A MAGAZINE FROM TRELLEBORG GROUP | 3·2021

Solutions that seal, damp and protect critical applications.

PLUS

DEVICES FOR FAST AND SAFE INJECTIONS

A SHIELD THAT CAN HANDLE GERMS

QUIET RIDES ON TOWBOATS

Will they take over?

Robots and humans can work together to create a better world.

CONTENT

EDITORIAL

MARINE CHALLENGES AND SOLUTIONS

Water is a recurring theme in this issue of *T-Time*. Access to clean water and sanitation for all is one of the UN's 17 global goals for sustainable development. Modern societies require well-functioning underground pipeline systems that provide fresh water and remove wastewater. Read more on page 13 about Trelleborg's product and solutions for pipes and other solutions for pure water.

Global maritime trade has almost doubled in the past 20 years. The sustainable trend in public transport means ferries are increasing in size too. Many ports can't keep up with these rapid changes. Andrew Thomas is providing us with insights to challenges ports are facing the coming years.

Perhaps you are more interested in the boats themselves? Then you can read about Trelleborg's antivibration solutions for towboats that make the ride quieter and more comfortable.

Peter Nilsson,
President and CEO

Cover photo:
Vincent Fournier/Gallery 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 has annual sales of about SEK 33 billion (EUR 3.13 billion, USD 3.57 billion) and operations in about 50 countries.

The Group comprises three business areas: Trelleborg Industrial Solutions, Trelleborg Sealing Solutions and Trelleborg Wheel Systems.

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

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TRELLEBORG

PHOTO: SHUTTERSTOCK

The robot ASIMO, created by Honda at the dawn of the millennium, gave us a vision of the future.

Robots: Friends or Foes?

Will robots take over the world? Will they replace humans? Do we need to fear them, or can we work together to create a better and more fulfilling world? The evidence says we can.

TEXT JAN SKLUCKI **PHOTOS** UNSPLASH & SHUTTERSTOCK

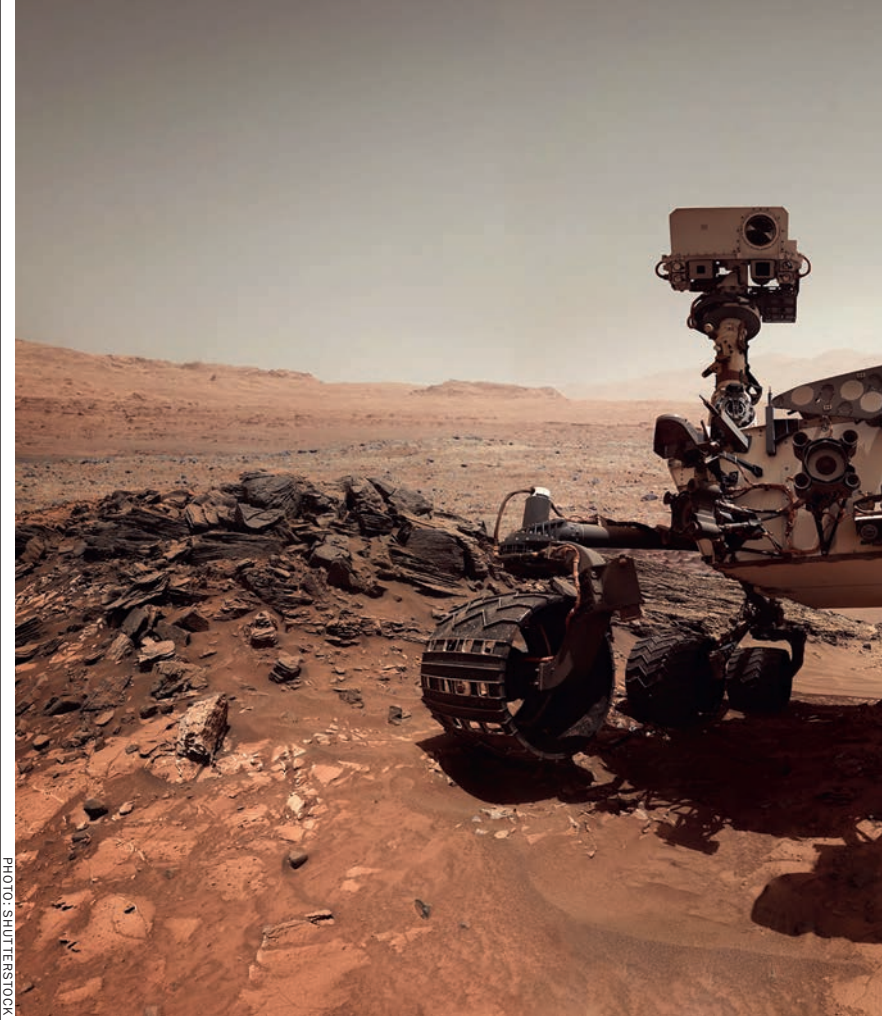

PHOTO: SHUTTERSTOCK

When you think of robots, what comes to mind first? Perhaps Arnold Schwarzenegger's portrayal of a humanoid assassin from the future in *The Terminator*, or Baymax, the friendly healthcare assistant from *Big Hero 6*? Robots have alternately been viewed by humans with both fascination and fear, as seen in the many different visions of robots featured in popular culture, through comics, films and books. Regardless of these perceptions, robots are both visibly and invisibly playing a more prevalent role in our lives.

The term "robot" is from the Czech word for "forced labor," originally used in a play by Karel Čapek about a mechanical workforce that rebelled against its human creators. Perhaps justifiably, many workers have a fear of automation and the loss of jobs it can bring. "But actually, we needn't consider robots in this way," says Yusuke Takita from the marketing department at Trelleborg Sealing Solutions in Japan. "They can create more jobs and move people away from repetitive or hazardous tasks to more important and higher-level jobs that truly add value."

Humankind already makes good use of robots to operate in hazardous environments. Industrial arms handle high temperatures and poisonous atmospheres. Another example is the exploration rovers that traverse the surface of Mars to provide scientists with valuable data about the planet. "Use of robots can advance humanity as a whole, especially when working side by side," Takita says. "And, as costs of robots fall, more menial tasks can be further automated."

With increased focus over the past decade on increasing efficiency and optimization, freeing people for more important work is crucial. Simple tasks could be performed by a robot that would previously have been considered too expensive, with machines designed to reduce repetitive strain injuries or to lift and transport heavy loads, further reducing the harmful impacts that work can have on humans.

2.7
million robots were at work in factories across the globe in 2020.

In 2010, at least 120,000 robots were installed in manufacturing facilities. Five years later, 254,000 units began their diligent work in production lines across

ROBOTS IN THE REAL WORLD

ASIMO

Created by Honda at the dawn of the millennium, ASIMO gave us a vision of the future. A humanoid social robot, it has been continually developed over the past few decades. It can understand human gestures and respond to them. Unlike many other social robots, it has a range of movement, including walking, running and climbing stairs.

PARO

Why should robots be limited to humans? PARO looks just like a baby seal and is intended to provide therapeutic care to patients in hospitals and nursing homes. It is designed to serve the same purpose as conventional animal-assisted therapy, but without any of the mess of a real animal.

Exploration rovers traverse the surface of Mars to provide scientists with valuable data.

> **“Use of robots can advance humanity as a whole, especially when working side by side.”**
>
> Yusuke Takita, Trelleborg

the world. The latest reports state that in 2020, more than 2.7 million robots were at work in facilities across the globe, an increase of 12 percent over 2019, with more than 373,000 units shipped in the last year alone, according to the International Federation of Robotics, 2020.

The automotive industry was the first to adopt robots in the 1960s and even now, 60 years later, it is the largest purchaser of industrial robotics. “Thirty percent of industrial robots are being sold to automotive companies,” Takita says. “Investments in new modern production methods and increased production capacity in emerging markets have increased demand. But the electronics market is definitely competing for the number one spot now.”

Globally, Asia is the largest market for industrial robotics. “Two out of every three new robots in 2018 were installed in the region,” Takita says. When looking at the figures, it’s hard not to notice that five countries stand out. “China, Japan, the U.S., South Korea and Germany account for 74 percent of global robot sales,” he says.

As Industry 4.0 encourages manufacturing trends that incorporate more automation and data-driven approaches (the so-called Fourth Industrial Revolution), the robotics industry is the natural forerunner for many of these systems.

Da Vinci Surgical System
Surgery requires a steady hand and the highest levels of accuracy. Though first developed in 1985, surgical robotics have come a long way and are taking more and more responsibility during operations. The da Vinci senses a surgeon’s hand movements and replicates them, scaling them down and removing any tremors.

Unimate
Considered the first industrial robot, the name Unimate is a portmanteau of “Universal Automation.” It was first developed for General Motors in 1961, taking die-cast components and welding them onto vehicles. The robot was designed to take over this dangerous and potentially toxic process, preventing injury to humans.

Robear
Another medical robot, but instead of surgery, Robear takes over heavy lifting tasks, such as moving an elderly patient from a bed to a wheelchair or helping them to stand up. Nurses may be required to lift a patient 40 times in a single day, potentially damaging their backs and taking valuable time.

"We're seeing increased desire for complete autonomy using artificial intelligence (AI), not just in production, but in ordering and transporting, now termed manufacturing execution systems, which tie in with enterprise resource planning," says Takita. "The robots are fully integrated into the system and improve all the time as more and better data is available and further connectivity is possible.

"Demand for trainable AIs and upscaling of existing systems is also increasing as companies explore this exciting new field. Much of Trelleborg's focus is in the already huge industrial robotics market, where they can add value to new applications requiring precise motion with advanced specifications.

"We're also expecting to see more movement from automation to autonomy," Takita continues. "Automated Guided Vehicles (AGVs), which rely on lines, wires or magnets to navigate, are more often being replaced by Autonomous Mobile Robotics (AMRs)." Unlike AGVs, AMRs don't require supporting infrastructure and are frequently implemented for product picking optimization in logistics. They need just "start" and "finish" locations and can safely navigate around obstacles, choosing the most efficient alternate route.

"Much of Trelleborg's focus is in the already huge industrial robotics market, where they can add value to new applications requiring precise motion with advanced specifications."

Yusuke Takita, Trelleborg

As costs come down, more personal-use robots are entering the market with interesting new purposes. The vacuum cleaner robot is already taking the drudgery out of housework in many households. In the not-so-distant future, you could have a robot "coach" that analyzes your form while weightlifting or playing sports and tells you how to correct your posture, while another robot teaches your children in school. "Healthcare and medical can certainly gain from recent technological innovations," Takita says. "AI-based, data-driven diagnostic systems, personalized medicine and assistants for people with special needs are more than possible now."

The first robots for surgery were designed in 1985, and the first tele-surgery took place in 2001. Now, digital and robotic tools are permeating all aspects of medicine, enabling more patient-centric approaches. Smart devices allow patients to monitor their own health "on the go," and expectations are growing for more and more medical devices to incorporate the same functionality. This brings additional challenges for the components within. New medical devices must be smaller to allow a wearer to conceal them, requiring them to be less invasive and easier to use.

"Accelerating the development of new devices requires close collaboration between manufacturers and their suppliers," Takita says. "Using newer technologies, such as precision multicomponent molding, the possibilities for miniaturization and part consolidation are greatly extended – making products that can be absolutely life-changing for patients, giving new hope and improving quality of life in a way that was completely impossible only a short time ago." ■

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Sealing solutions

To the robotics industry, Trelleborg is a leading supplier of seals and other polymer solutions. It supported the development of the sophisticated hydraulic systems in the early industrial robots and continues to supply innovations to optimize performance of new developments in this fast moving sector.

Below: AMRs are frequently implemented for product picking optimization in logistics.

PHOTO: SHUTTERSTOCK

NEWS

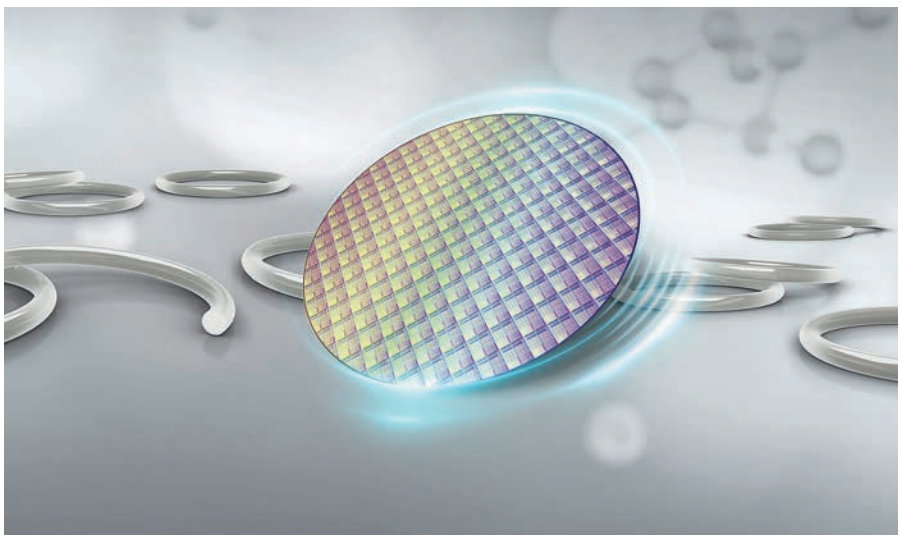


PHOTO: TRELLEBORG

Fab four

Four best-in-class materials in the Isolast® PureFab™ range, have been specifically engineered for critical semiconductor sealing applications.

For original equipment manufacturers and Fabs (semiconductor fabricators), using these unique perfluoroelastomer formulations will increase product yield and reduce process defects. This will decrease downtime, extend product maintenance cycles and enable greater process uptime, resulting in a lower total cost of ownership.

Material handling

The next-generation forklift tire, the XP800 range, gives outstanding performance in medium-intensity material handling applications.

With its advanced tread design, the new XP800 enhances both indoor and outdoor performance to ensure maximum productivity. Its innovative design features an extra wide tread and unique profile for minimized vibrations, enhanced handling and excellent stability in indoor applications, while the lateral block design with deep lugs optimizes traction in outdoor areas.

PHOTO: TRELLEBORG

Valtra 70 years young

70

Trelleborg celebrates Valtra's 70th anniversary with its tire personalization service, YourTire.

These will be used on a limited edition Valtra T Series released to celebrate the occasion, in the company's signature deep metallic red. YourTire gives customers the opportunity to customize a new set of Trelleborg radial tractor tires with their name and logo.

For more information on YourTire, visit https://www.trelleborg-yourtire.com/

Now open – first African facility

The construction of Trelleborg's first African manufacturing facility is complete. The site, near Kenitra, Morocco, will manufacture automotive boots for local customers. This investment establishes Trelleborg's automotive boots as a truly global product as these components are now produced on four continents.

Committed to improvement

Meet Sanjay Melvani, a Sri Lankan native who runs Trelleborg's operations in that country. Loving the business of producing tires, he wants it to roll better each year.

TEXT SUSANNA LINDGREN **PHOTOS** DILEEP MANN

Tires manufactured in Sri Lanka get equipment rolling all over the world – at airports, warehouses and many other environments where goods are handled.

"We produce tires for all the larger brands of handling and agricultural equipment," says Sanjay Melvani, the Managing Director for Trelleborg Wheel Systems in Sri Lanka.

A reject rate of just 0.1 percent speaks for itself. Melvani's smile contains an element of pride connected to production efficiency and to the level of trust given to him as he is managing one of Trelleborg's largest manufacturing sites.

Trelleborg has two plants in Sri Lanka, situated about nine kilometers apart just outside Colombo, in Sapugaskanda and Biyagama. Together they employ nearly 1,000 people who every month produce more than 1 million solid and pneumatic tires for forklifts and other material handling equipment, as well as for agricultural and forestry machinery.

About 90 percent of the tires produced are solid, designed to take high loads and to be cut- and punch-resistant. Pneumatic tires, which account for the remaining 10 percent of production, are used where machine and operator comfort, maximum traction and grip are important.

"Every year we have performed gradually better than the previous year in operational performance and safety, and in striving to make tire manufacturing more sustainable," Melvani says. "But if we are happy with what we did yesterday we are never going to reach a level of excellence."

That is what gives him the energy every morning to commute for more than an hour, on a good day, through a busy and heavily trafficked Colombo, to meet up with his team.

Sanjay Melvani took on the position as Managing Director for the Sri Lankan operations in 2014.

"It's not that I love the tire business, so to speak, it's the business I love," says Melvani, who joined Trelleborg in 2008 as finance director for the Sri Lankan facilities. This was in the midst of the financial crisis, a challenge that suited him well.

When five years later Trelleborg acquired a U.S.-based multinational with manufacturing sites in the U.S. and China, Melvani took over the financial functions for all three facilities. He spent most of the following two years with a suitcase as his closest companion.

"It was a busy and exciting time, which gave me a good understanding of cultural aspects and operational variations in different parts of the world," he says.

He took on the position as Managing Director for the Sri Lankan operations in 2014.

"Sri Lanka is in many aspects a very good country for manufacturing," Melvani says.

"Important for us is that we can source all-natural rubber locally." He explains that Trelleborg is one of the few tire manufacturers that actually use 100 percent locally produced natural rubber.

In Sri Lanka there are about 134,000 hectares (331,000 acres) of land under rubber cultivation. A significant proportion is cultivated by smallholders. Trelleborg deals not on a farmer level but through larger suppliers. However, the company is involved in several farm community programs to increase knowledge about productivity and sustainable rubber farming, and the company gives financial support to ensure replanting.

"We have also donated rubber tapping knives which for an outsider might sound a bit strange, but the key in the tapping is the knife," Melvani says. "You can either kill the tree or achieve the maximum out of it during its lifetime. That's why we have reached out to help farmers increase their productivity in this way, as well as by donating rubber plants to sustain availability."

To build awareness of safety and the code of conduct, Trelleborg also carries out educational programs for its suppliers who source the rubber produced by the farmers.

Training and development in Sri Lanka

Trelleborg is conducting various training and development initiatives for children and young people. In Sri Lanka, young people are coached in two schools through the Star for Life program.

Preschool children from disadvantaged families are offered educational development and nutritious meals at Antonio Bianchi's House preschool, which conducts daily Montessori-based activities.

PHOTO: SHUTTERSTOCK

Sanjay Melvani

Tires might be considered traditional, he says, but he finds the tire business very exciting. The main reason is that tires are a highly engineered product manufactured for versatile uses. His motto: Regardless of how well you did yesterday there is always room for improvement.

Melvani lives with his wife and two children, 18 and 14, in the Sri Lankan capital Colombo. Since his daughter moved from swimming lessons to synchronized swimming, a whole new water world opened up. He has followed her competition on a national level and for her country, when representing Sri Lanka in the world junior championships held in Budapest, Hungary. His son remains on land as a keen footballer. In his spare time, Sanjay likes to work on improving his fitness.

"In the future we are moving toward a potential shortage of natural rubber, and it's important to support long-lasting and sustainable rubber production."

Sanjay Melvani, Trelleborg

"In the future we are moving toward a potential shortage of natural rubber, and it's important to support long-lasting and sustainable rubber production," Melvani says. "We also have to find alternative ways to improve the productivity and availability of natural rubber."

The R&D department in Sri Lanka is an incubator for ideas about new materials and how to best optimize the use of raw materials. New products using a higher percentage of recycled pneumatic tires have been developed while ensuring that the quality aspects of the tires are maintained at the defined levels.

"We are also trying to find other natural and environmentally friendly materials that can be used in tire production, such as coconut, corn starch and other natural material, but the research is still at its cradle stage and we have to ensure a high-quality end product," he says.

To make production more sustainable, Trelleborg has re-engineered its Sri Lankan facility's steam production process and introduced an advanced biomass-fired auto feeding boiler. The production of steam is essential to the tire curing process and is traditionally carried out by a furnace oil boiler, which produces substantial carbon dioxide emissions. The biomass-fired boiler, installed at the larger facility in Sapugaskanda in 2019, has reduced CO_2 emissions by over 90 percent.

Below: Trelleborg has two sites in Sri Lanka, situated about nine kilometers apart just outside Colombo, in Sapugaskanda and Biyagama.

"We are constantly looking at other means to reduce our CO_2 footprint, and our next step will be to put up photovoltaic panels to generate electricity," Melvani says.

In Sri Lanka, Trelleborg has been singled out as best performer on many occasions by the local authorities. In four consecutive years Trelleborg received the presidential award for being the highest-value-added exporter in the rubber sector.

"Even during the Coronavirus pandemic we were awarded a certificate from the Sri Lanka Standards Institute (SLSI)," he says. "We were the first-ever company to be certified by SLSI with the Covid-19 Safety Management System Certification. The risk mitigation protocol we have in place has become an example for the rest of the industry." ■

For more information:
www.trelleborg.com/en/career


5
TRELLEBORG
3

TEXT DONNA GUINIVAN
ILLUSTRATION NILS-PETTER EKWALL

PURE WATER

What is essential? Fundamental to life is the water that we drink. Keeping this vital resource available and as pure as possible is critical. Trelleborg focuses on ways to do this, from sustainable measures at its manufacturing facilities to innovations in water infrastructure, hoses and sealing systems. ■

1. Watertight piping
High-quality seals keep drinking water and wastewater securely in concrete and plastic pipes to prevent soil contamination and loss of scarce resources.

2. Pipe refurbishment
Innovative no-dig solutions for water pipe repairs are quick and easy, and prevent disruption in urban situations.

3. Effective processing
Teguflex DW is an expansion joint used on rigid pipes in water systems. Absorbing elongation and movement, it protects installations and damps noise.

4. Approved seals
Domestic sealing solutions for potable water must meet a wide variety of stringent global standards and regulations.

A focus for all Trelleborg facilities globally is to continue to lower their environmental impact. Water is used in Trelleborg's operations mainly for cooling and washing in production processes. In regions where water scarcity may become an issue, measures include those like in Malta, where rainwater on site is used for its cooling systems.

Olympic endeavors

At 50 meters long and 25 meters wide at an average depth of two meters, an Olympic-sized swimming pool contains 2,500,000 liters or 2.5 megaliters of water. If you used an ordinary garden hose to fill the pool, it would take 52 days.

PHOTO: SHUTTERSTOCK

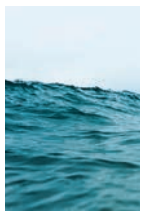
PHOTO: SHUTTERSTOCK

Well flushed

Did you know one of the largest consumers of water in your home is the toilet? Older conventional toilets can use over nine liters of water at every flush, but the latest eco models use as little as two. As the average person flushes the toilet five times a day, that can save as much as 12,775 liters per year from going down the drain.

Water, water, everywhere

In *The Rime of the Ancient Mariner* by Samuel Taylor Coleridge, the mariner bemoaned the fact that there was "water, water everywhere" but not a drop to drink. Desalination of seawater into drinkable water is a challenge that has faced man through the ages.



H_2O

Water is composed of two parts hydrogen to one part oxygen.

1 in 3

According to UNICEF and the World Health Organization, one in three people globally suffer from poor access to water, sanitation and hygiene. Some 2.2 billion people around the world do not have safely managed drinking water services, 4.2 billion people do not have safely managed sanitation services, and 3 billion lack basic handwashing facilities.

PHOTO: SHUTTERSTOCK

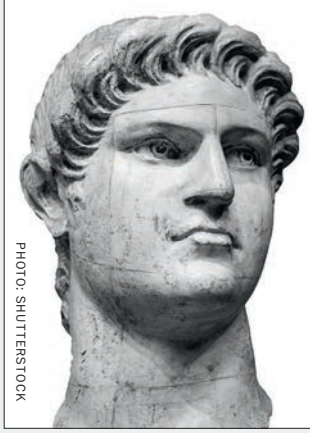


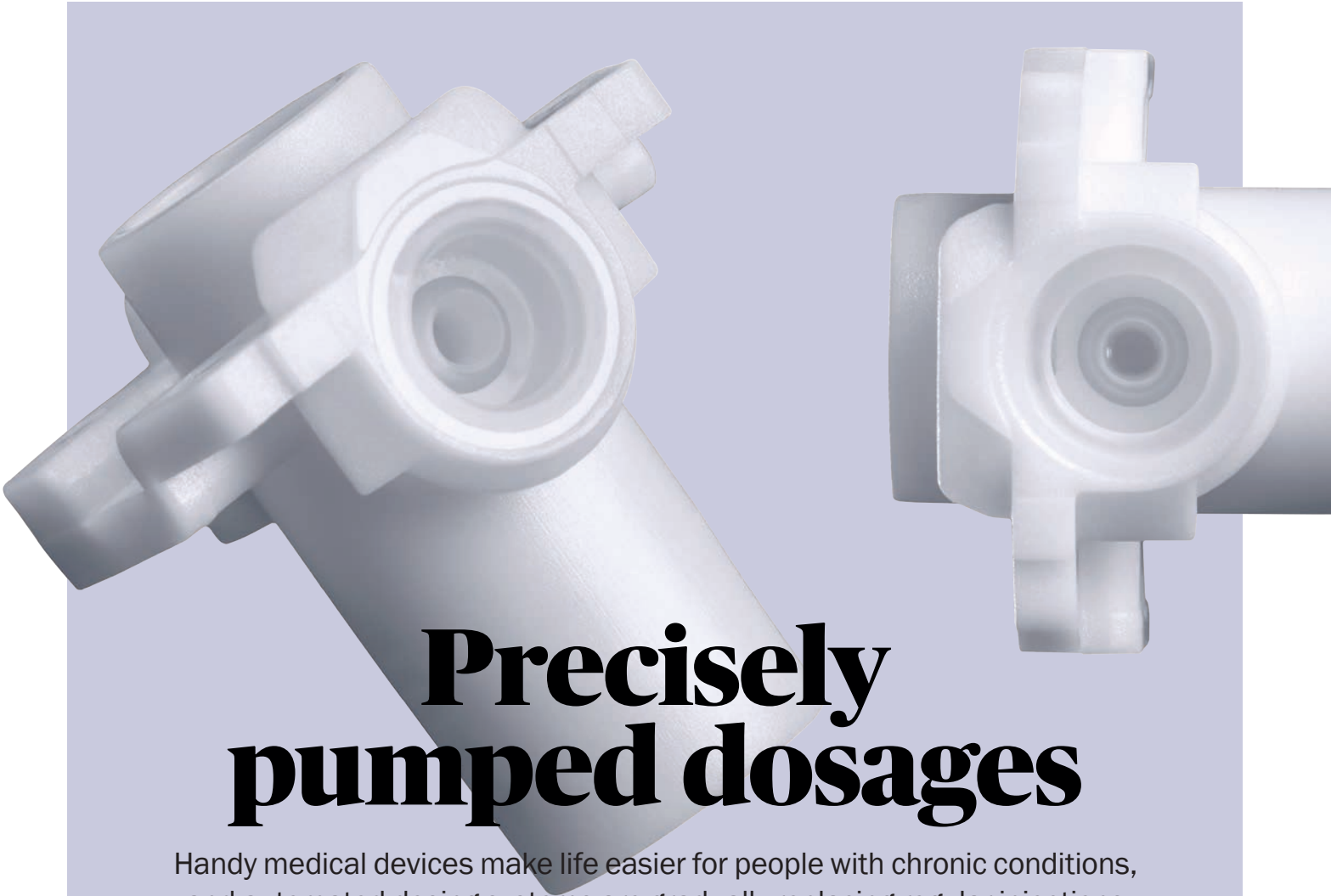
PHOTO: SHUTTERSTOCK

Roman remains

Potable water is water that is safe to drink. The term comes from the Latin *potare*, meaning to drink. The Romans built some of the world's first aqueducts, above-ground channels that brought potable water from the mountains to the cities.

2 liters

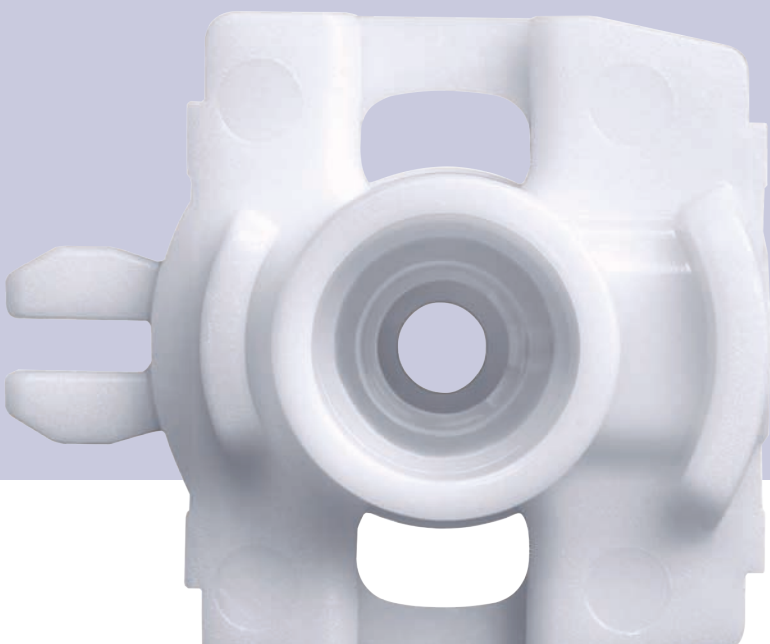
The recommended amount of water for a healthy adult is two liters per day.



Precisely pumped dosages

Handy medical devices make life easier for people with chronic conditions, and automated dosing systems are gradually replacing regular injections of essential medication. Trelleborg cooperated with WACKER to develop a microinjection pump, the very heart of such devices.

TEXT ERIK ARONSSON **PHOTOS** WACKER



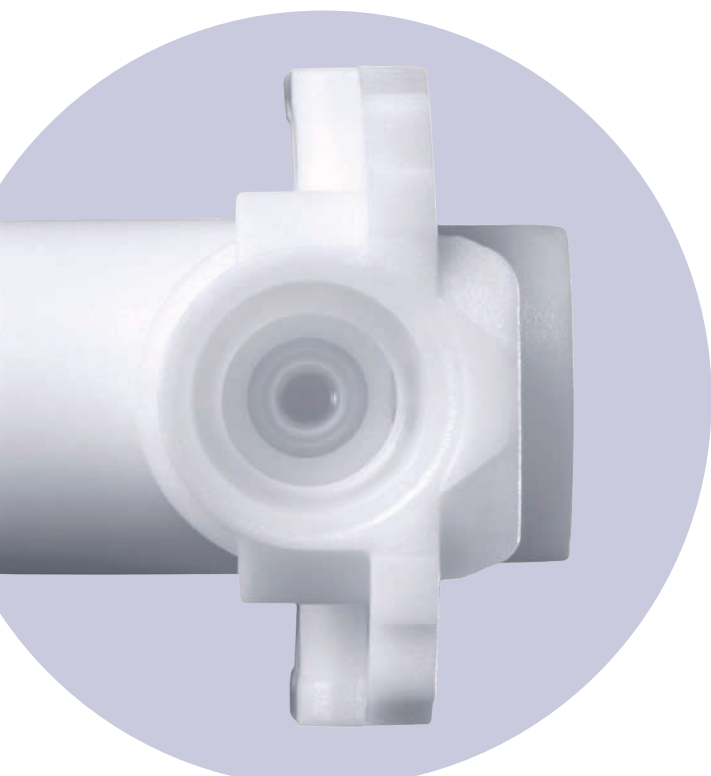
Automated dosage systems make life easier for people with chronic conditions.

People with chronic illnesses need to monitor their bodies. Diabetics check insulin levels and people suffering from Parkinson's adjust their apomorphine dosage. Incorrect administering of medication can make treatment less effective or even, in the worst cases, be life-threatening.

Some conditions can be managed well with injected drugs. Portable medical devices, such as insulin pens, are especially convenient, enabling the fast and safe injection of liquid medication in everyday situations. The users, however, still need to remember the dosage and timing precisely.

Automated dosing systems go one step further. These palm-sized medical devices can be attached directly to the skin with adhesive plasters, for example. Located on the surface in contact with the patient is an extremely fine needle that extends automatically to inject a preprogrammed quantity of medicine without the user having to make a single move. Precise control regulates delivery of as little as a few microliters of active ingredient over a period of minutes, hours or even several days. This improves the quality of life of those affected, granting them more flexibility and making delivery of medication worry-free.

The centerpiece of these medical devices is a tiny microinjection pump that reliably delivers precise doses of essential medication. Trelleborg Sealing Solutions was commissioned by one of the world's



Left:
The pump housing comes in different versions.

Right:
Felix Schädler, Project Manager at Trelleborg.

PHOTO: WACKER AND TRELLEBORG

leading suppliers of pharmaceutical and medical products to help develop a pump housing made of plastic and silicone. Deep inside this pump a unique, innovative material from the German chemical industry company WACKER, ensures smooth operation.

"The pump's extremely precise dosage of drugs was crucial to the success of the entire device," says Felix Schädler, Project Manager at Trelleborg Sealing Solutions, who played a key role in the development.

The delicate microinjection pump consists of a cylindrical hollow body in which a plunger is moved up and down electrically. It draws the drug from a supply vessel and conveys it to the injection needle. The pump housing comes in different versions that can deliver two microliters or ten microliters of liquid medication. With a length of 15 millimeters, the smaller pump is not much bigger than a fingernail.

Friction, sealing and the bonding of two different materials in a very tight space posed a challenge to the developers from the start. In addition to wanting a compact design, the customer also attached importance to the lowest possible cost, as the injection pump in the final medical device is a single-use product.

Above: Trelleborg Sealing Solutions was commissioned to help develop a pump housing made of plastic and silicone.

"The pump's extremely precise dosage of drugs was crucial to the success of the entire device."

Felix Schädler, Trelleborg

For safety reasons, all the elements of the dosing system that come into contact with the medication or the user, including the injection pump, must be disposed of after use. But other components, like the housing, motor and battery, can be reused.

"Due to the compact dimensions and low tolerances involved, the part could only be manufactured using two-component injection molding with seals made of liquid silicone rubber," says Schädler,

Processing Liquid Silicone

Rubber (LSR) is the field of expertise at Trelleborg's Stein am Rhein site in Switzerland. The site has a comprehensive cleanroom production facility for medical technology applications, where production takes place under strictly controlled and monitored conditions.

Two-component injection molding is increasingly in demand for medical applications. "Self-adhesive LSR grades are available for food-contact and medical situations, making two-component injection molding possible for these applications," says Schädler.

When Thermoplastic Elastomer (TPE) proved unsuitable for this specific application, Schädler and his team initially turned to SILPURAN® 6700 self-adhesive liquid silicone rubber. WACKER has marketed specially developed silicones for medical technology under the SILPURAN brand for a little over 10 years. "In this LSR line for sensitive applications, we use special formulations that can satisfy particularly demanding purity requirements,"

PHOTO: WACKER AND TRELLEBORG

"A wholly new materials technology was developed and ready for marketing within just one year."

Felix Schädler, Trelleborg

says Dr. Ulrich Frenzel, who works in technical marketing at WACKER.

The exceptional adhesion to a number of thermoplastic materials makes WACKER's self-adhesive LSR grades ideal for two-component injection molding.

Tests conducted with the medical-device manufacturer and Trelleborg's elastomer laboratory in Stuttgart, Germany, demonstrated, among other things, that SILPURAN 6700 can withstand long-term storage with the medication. Since the drugs come into direct contact with the seals, interactions of any kind had to be ruled out. When the pump's functionality was put to the test, however, it turned out that the friction between the plunger and the cylinder surfaces made of SILPURAN 6700 was too high.

Even the slightest over- or underdosage of medication can lead to life-threatening situations for the user; it is therefore essential for the pump to operate smoothly. If friction between the plunger and cylinder were high, more force would have been required for the pumping action, which in turn would necessitate a different drive and thus a larger device overall. Alternatively, the customer could have used lubricants. Those, however, would inevitably come into contact with the drug being delivered and possibly impair or, in the worst case, contaminate it. For the same reason, the use of oil-bleeding silicones such as those offered by WACKER for automotive applications was ruled out.

But WACKER's materials specialists managed to find a solution that works without oil.

"We presented this challenge to WACKER's material developers and they very quickly came up with some initial ideas for an innovation that might work," says Schädler. "A wholly new materials technology was developed and ready for marketing within just one year."

Dr. Florian Liesener from WACKER's technical marketing says, "We already had liquid silicone rubbers with self-adhesive properties in our portfolio, as well as products with low coefficients of friction, but none for sensitive applications that offer both together. The micropump was thus the perfect opportunity for us to combine both properties in one silicone."

Above: The Trelleborg site in Stein am Rhein in Switzerland has a comprehensive cleanroom production facility for medical technology applications.

The resulting LSR needed properties that appear physically incompatible: high adhesion and low sliding friction – in other words, holding on and letting go at the same time. Impossible, one might think. "Yet WACKER demonstrably solved this chemical conundrum, without any problems," Schädler says.

The material developed made its public debut under the name SILPURAN 6760/50 in 2016. To this day, it is the only market-ready, self-adhesive, friction-modified liquid silicone rubber with biocompatibility certificates.

SILPURAN 6760/50 plays an important and reliable dual function in the compact drug-delivery device. It may be invisible to its users, but it gives them completely new freedoms. ■

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NEWS

Virtual showroom

Trelleborg's tires are on show in a virtual showroom that can take customers on a 360-degree experience. Customers can also connect with Trelleborg experts in the immersive virtual space. No matter where they are in the world, customers can schedule a meeting with a Trelleborg representative, simply by selecting the person they want to speak to in the country of their choice.

To discover Trelleborg's virtual tire showroom visit https://virtualshowroom-wheels.trelleborg.com

Light and flexible

Since its launch in 2017, the Performer Ceramic hose has demonstrated a life in application up to 20 times longer than rubber hoses. It is 30 to 60 percent lighter and five times more flexible than other ceramic hoses.

Previously limited to diameters from 50 to 200 millimeters, Trelleborg's extended range spans from 40 to 400 millimeters in response to customer requests, bringing the benefits of the Performer Ceramic hose to even more types of destructive conveying applications.

PHOTO: TRELLEBORG

60 years of manufacturing

60 years of operation in Malta by Trelleborg in Malta was celebrated by a visit from the Maltese Prime Minister. Located in Hal Far and Marsa, the manufacturing facility produces 25 million O-Rings and engineered seals per week for a global customer base, including many of the world's leading car manufacturers.

Over the years the operation has reinvented itself and increased its product portfolio to be at the forefront of new innovative products in the field of elastomers and more recent additions of multicomponent and micro-molded part manufacturing.

Revolutionary food sealing

A revolutionary new elastomer sealing material, FoodPro™ E75F1 is available from Trelleborg. Demonstrating compliance with the most comprehensive global food contact material regulations, it is specifically engineered for universal use in food and beverage processing applications. For manufacturers of food and beverage equipment, FoodPro E75F1 saves time and costs by making it easy to specify materials that work in their products globally.

PHOTO: TRELLEBORG

A smooth ride

When you own a multimillion-pound yacht, the ride to ship from shore should be as comfortable as the rest of the trip. This was something that Williams Jet Tenders, a UK-based manufacturer of support vessels, wanted to ensure.

TEXT JAN SKLUCKI **PHOTOS** WILLIAMS JET TENDERS

> **"Using our design, sourcing, assembly and supply solutions, we managed to contribute further improvements to the 'fix' we offered to the customer."**
>
> Liam Walsh, Trelleborg

Excessive vibrations from a tender's diesel engine can transfer to its hull, leading to a less than comfortable ride. "Superyachts are the height of luxury and designed from head-to-toe with relaxation in mind," says Liam Walsh, Key Accounts Manager at Trelleborg Sealing Solutions in Southampton, England. "An uncomfortable ride, even on this small part of the journey from land to ship, could really detract from this."

In search of a solution, Williams Jet Tenders found Southampton-based Race-Tec, a high-performance specialist in this area that is now part of Trelleborg. Using finite element analysis software, engineers quickly saw that a solution could be provided by a custom elastomeric molding between two housings, situated around the shaft to effectively lessen the vibrations. "Our engineers identified the problem area and applied their expertise," Walsh says. A simple solution to a serious problem.

"Using our design, sourcing, assembly and supply solutions, we managed to contribute further improvements to the 'fix' we offered to the customer," Walsh says.

Trelleborg took the molding and turned it into a fully assembled, packaged and final solution for the customer, offering more value than was expected. The assembly includes the tailshaft, halfshaft coupling, bearings, spacers and the original molded components. "All the components were supplied fully assembled to the customer, saving time and costs by removing secondary operations," Walsh says.

"Though this story started a decade ago, it didn't end there," he says. "Because of the combined expertise of our Southampton facility and the customer's satisfaction with the assembly, this led to the development of another, further improved assembly."

This new, shorter assembly has the same characteristics as the original development, but due to its shorter shaft and more compressed coupling area, it can be added to other tenders in the customer's range, reducing suppliers and simplifying purchasing. "This cemented the relationship between Trelleborg and the customer and expands the opportunities for both parties," Walsh says.

Orders have been received for the initial production run and Walsh attributes the success of this project to looking beyond the original inquiry and striving to work closely with the customer, adding value where possible. "This is built on the skills and experience of our Southampton team, and we look forward to new opportunities in the future," he says. ■

Liam Walsh

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What is a tender?
Tenders are small support vessels for superyachts, often used for entertainment or quick transport.

Williams Jet Tenders

Williams Jet Tenders is the world's leading jet tender specialist, having designed and developed the world's first four-stroke jet and turbojet range of tenders more than 15 years ago. Founded in 2004 by Roy Parker and the brothers Mathew and John Hornsby, the company employs more than 90 staff and is supported by a team of factory-trained engineers across the world.

The company has an 80,000-square-foot purpose-built facility in Oxfordshire, England, and each tender is hand-made by a team of dedicated and skilled craftsmen who pride themselves on quality. The tenders also undergo an on-water test procedure prior to dispatch, ensuring that every aspect of its construction is checked and meets the high standard set by Williams.

Toward more sustainable waterways

There are plenty of challenges facing the world's waterborne transport infrastructure, but New York-based ports and maritime consultant Andrew Thomas, also sees lots of innovative solutions being proposed.

TEXT DANIEL DASEY **PHOTOS** PONTUS HÖÖK

The Earth's oceans, canals, ports, marinas and rivers form perhaps the most critical piece of transport infrastructure on the planet. By providing commercial transport corridors between continents and nations, our waterways facilitate the vast bulk of international trade. Keeping waterborne transport corridors and ports running efficiently, safely and sustainably, is vital for both today's economy and the planet's future.

It's a challenge that has occupied much of the working life of Andrew Thomas, a New York-based ports and maritime consultant. Thomas is a Regional Maritime Lead for global engineering and architectural services company HDR, and his daily work revolves around ports and maritime asset management. He recently completed a four-year term with PIANC, the World Organization for Waterborne Transport Infrastructure. As a member of PIANC's executive committee, Thomas was involved in the organization's core business of providing the global waterborne transport community with expert guidance, recommendations and technical advice.

With such a deep involvement in maritime matters, Thomas understands better than most the evolving trends and challenges facing the planet's waterborne transport infrastructure. "At HDR, we help

"Owners are constantly faced with the question of repair versus replacement."

Andrew Thomas, Regional Maritime Lead for HDR

position our clients to navigate new trends like climate change initiatives, we help them manage and maintain waterfront assets, and we provide support in deepening harbors and designing structural upgrades at berths to accommodate modern-size vessels," he says.

One of the biggest maritime infrastructure trends of recent years, he says, has been the ongoing impact on ports of the 2007–2008 global financial crisis. The financial austerity caused by this led many waterfront owners to focus increasingly on maintaining and repairing infrastructure assets such as wharves and quay walls, rather than replacing them. As a result, maritime engineers are being called on to find creative ways to extend the working life of such infrastructure.

A case in point is the New York-New Jersey Harbor complex. Asset owners are looking for cost-effective maintenance solutions, while at the same time trying to manage aging infrastructure and the growing impacts of such hazards as marine borers eating away at the timber piles. "Owners are constantly faced with the question of repair versus replacement," Thomas says. "When you're talking about miles of shoreline infrastructure, whether it's for public enjoyment or commercial throughput, even the most economical solution can involve major capital investment."

In the wake of Covid-19, Thomas says, maritime operators are under increased pressure as the global supply chain tries to make up for time lost during the worst of the crisis. In general terms, both the volume of goods transported annually and emphasis on waterways is growing as the world's population increases and developing nations have increased access to e-commerce.

Thomas points to climate change as another major issue facing waterborne transport and ports. Rising sea levels add a layer of complexity when it comes to long-term capital

PIANC

PIANC is a global organization that provides guidance and technical advice to enable the creation and maintenance of sustainable waterborne transport infrastructure, including ports, marinas and waterways. The name PIANC is derived from the organization's former name, the Permanent International Association of Navigation Congresses. PIANC's mission is supported by a global network of national governments, public authorities, corporations, and individual experts.

HDR

HDR is an employee-owned design firm specializing in architecture, engineering, environmental and construction services. It has some 10,000 employees worldwide.

Above: Andrew Thomas (left) and Richard Behnke, Project Executive, at the HDR office in New York.

planning of port infrastructure. Raising a port's elevation not only impacts its waterfront structural configuration, but also the utilities, drainage, and even the yard layout. With extreme weather events driven by climate change creating new challenges, ports and operators are also examining their use of fossil fuels.

"There's a really big emphasis with ports on the types of energy they use and how they can reduce greenhouse gas emissions. But as we transition into a more sustainable world, we also have to be mindful of today's economics and the oil and gas energy that we're currently using and why we're still using it. Ports also play a critical role in the development of renewable offshore wind energy. Namely, the marshalling and manufacturing of offshore wind components. Commanding heavy loads and requiring a lot of space, they must be accessible by specialized vessels for waterborne transport."

While the challenges to the sector are plentiful, Thomas is also encouraged by some of the innovative solutions being offered. He is

Andrew Thomas

Job: Regional Maritime Lead for HDR

Lives: Formerly in Manhattan, but now in Westchester to the north of New York City

Family: Wife Yulia

Interests: Diving, global travel, auto racing, ice hockey, golf, financial markets

a firm believer in finding solutions tailored to local needs and conditions, both inside and outside of the ports.

"For seaports in places like the Philippines, one of the challenges you will face is the transportation system outside the port being constrained and congested," he says. "In this case, your focus might be on terminal and berth allocation and where to disperse the cargo so you're maximizing the waterborne component of the supply chain as much as you can. Whereas if you are somewhere like the Netherlands, where more than 40 percent of cargo moves through inland waterways, you're going to focus on solutions that optimize the canal system."

Thomas says he also sees quality products supplied by established vendors as a key element in enhancing waterway sustainability. "I'm a big proponent of well-made products," he says. "Sometimes these require more upfront investment, but you have to consider the whole lifecycle, because spending less today on a product you'll need to replace every five years will actually cost a lot more than a superior product with a longer lifecycle. When it comes to leasing a seaport terminal, longer term concessions are becoming more common, so proactive maintenance management becomes more important. This has really big implications on things like marine fenders, drydock seals, or anything involving compounds designed for the marine environment or particular loading criteria." ■

"Spending less today on a product you'll need to replace every five years will actually cost a lot more than a superior product with a longer lifecycle."

Andrew Thomas, Regional Maritime Lead for HDR

Towboats pushing barges experience heavy vibrations from the cavitation caused by their powerful propulsion engines. Air bellows separating accommodation from the hull allow the crew to work and rest in a quiet, comfortable environment during round-the-clock operations.

TEXT SUSANNA LINDGREN **PHOTO** GETTY IMAGES

Quiet, please!

M/V H. Merritt "Heavy" Lane Jr is the latest flagship in the fleet of towboats of the New Orleans-based Canal Barge Company (CBC) In her first year in service, the boat has trafficked the Mississippi River, from downriver New Orleans to up beyond Cairo, Illinois, handling up to 30 heavily loaded barges at a time.

The 50-meter-long (166-foot) *"Heavy" Lane* is one of the larger towboats serving the US inland waterways industry. It's not its size, though, that makes this 6,000 horsepower vessel different from other towboats on the waterways, it is the air bellow vibration isolators that minimize the transmission of noise and vibrations from the operating machinery to the crew's accommodation. The crew on *H. Merritt "Heavy" Lane Jr* is one of the first in the United States to benefit from using Towair, the air-based anti-vibration spring solution from Trelleborg Industrial Solutions.

Working on a towboat can be a noisy business. The shape of a towboat's hull along with high-powered propulsion engines can create considerable noise, and in certain circumstances heavy vibration from cavitation that is caused by air bubbles created by the boats' propellers. The benefit of using Towair is that the system keeps the crew in the deckhouse accommodation protected from noise and vibrations, even if the vessel itself is exposed to these.

"The excellent isolation of Towair reduces noise transfer significantly and eliminates all vibrations starting at 3 Hz," says Ruud van Wijngaarden, Engineering Manager at the Trelleborg's Marine Center in the Netherlands.

Ruud van Wijngaarden has worked with shock and vibration solutions for more than 25 years, and Towair has been used on European waterways to protect the crews for longer than that. He points out, this shows that it is a reliable, durable, well-proven system, the heart of which is a series of air bellows mounted underneath the deckhouse.

"Air separates the accommodation from the hull," says van Wijngaarden. "A relatively simple but ingenious pneumatic system regulates the compressed air in the springs and keeps the deckhouse at a constant height, allowing several centimeters of travel in a vertical direction, regardless of the load on the springs. This construction also makes Towair easy to service and maintain."

American towboats and barges tend to be larger than the ones trafficking European inland waters. The size of the cargo is determined by the size of the towboat and the river condition, and the largest boats on the Mississippi river can tow between 35 and 40 barges, each about 60 meters (200 feet) long and 11 meters (35 feet) wide. Configured into a rectangle they can measure the size of three football (soccer) fields and hold thousands of tons of payload. Towboats like *"Heavy" Lane* typically tow liquid cargo such as lubrication oils or chemicals for the petrochemical industry, or dry cargo such as rock, gravel, sand, pig iron or coal.

"The trend in the US over the last few years has been to build larger towboats with increased horsepower, which enables more payload to be transported," says Steve DeMaagd, Key Account Manager at Trelleborg in the U.S. "When you increase horsepower and payload, the vibrations onboard will increase. This makes it harder for traditional spring systems to protect the crew from damaging noise and vibrations. The use of Towair makes a huge difference."

When CBC added *"Heavy" Lane* to its 48-vessel fleet in 2020, the towboat was the first the company had contracted in several decades, and crew comfort was one factor driving the business decision.

"When setting out to draw up the specification for the vessel, we took a number of factors into consideration," says Mike Stone, Manager of Vessel Engineering at CBC. "Improved crew comfort was important. We had received favorable feedback from operators with an air-cushion installation, and the maintenance on the system was reported to be very minimal."

The crew size on *"Heavy" Lane* is typically nine people who work in 28-day shifts, which means they spend long periods onboard.

"A smoother and quieter

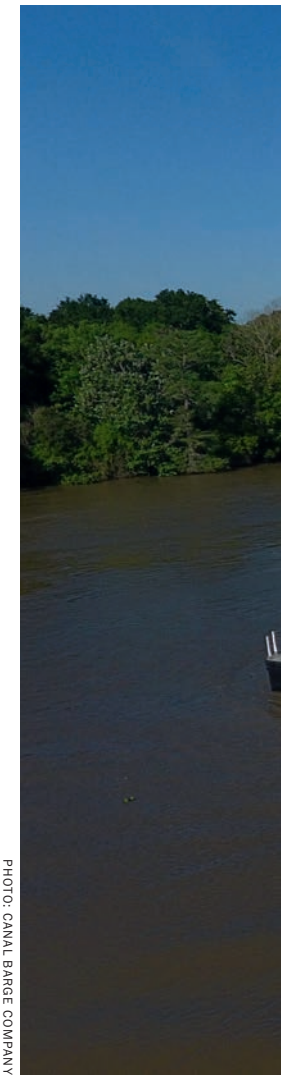

PHOTO: CANAL BARGE COMPANY

Right: The 50-meter-long *"Heavy" Lane* is one of the larger towboats serving the U.S. inland waterways industry.

Towair

Towair is the solution for towboats to protect the crew, onboard systems and the ship itself against the major negative impacts of vibration and noise. It also offers protection against harmful ultra-low frequencies, which are impossible to isolate using conventional solutions.

accommodation space gives the crew the best opportunity to find peaceful rest and provide better performance," Stone says. "Crew comfort also leads to consistency. Crews will want to remain on the boat and will perform at a high level to ensure their place onboard, which helps the company in the long run."

Stone is pleased with the decision to invest in a Towair system, saying it really offers enhanced comfort compared with a rigidly installed accommodation house.

"The Towair system takes an active approach to compensating for the normal vibrations and movements, and offers more versatility than the passive system we have installed on other vessels of similar size and power, even if the crews from each of the vessels are glad to have their respective systems," Stone says.

While Towair is based on air bellows separating the crew from the vibrations in the hull, the most common anti-vibration solution on towboats is the use of steel springs.

"The best way to describe the difference is to compare Towair with the comfort of driving a Cadillac or a Mercedes," DeMaagd says. "Using steel springs for anti-vibration gives acceptable results but is more like driving a car from the 1970s where you can feel every bump in the road." ■

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"The Towair system takes an active approach to compensating for the normal vibrations and movements."

Mike Stone, Manager of Vessel Engineering at CBC

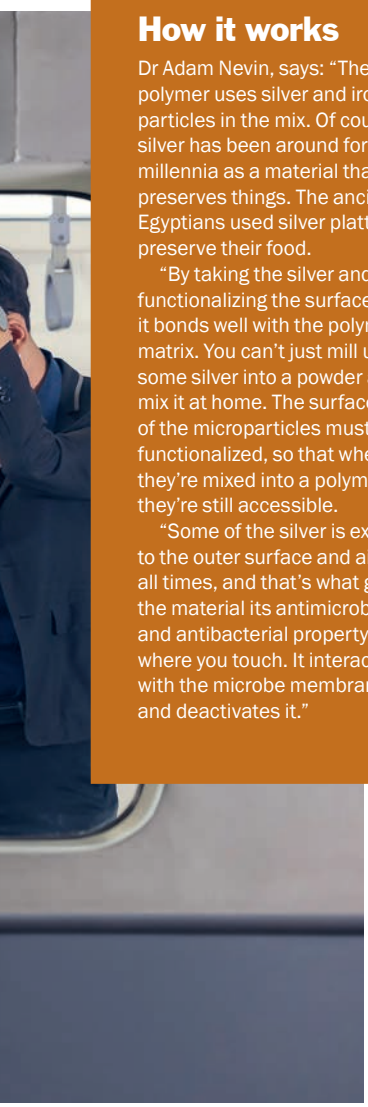
Bye bye, germs!

Trelleborg's new AMV Shield is an advanced polymer material with embedded protective particles in its surface to provide a consistent, durable defense against the spread of infection. It's a simple but effective innovation that can change our world for the better.

TEXT ANDREW MONTGOMERY **PHOTO** GETTY IMAGES

Door handles, push buttons, grab rails on public transport – they're just some of the many hot spots for the transmission of bacteria and microbes that can lay us low with the common cold, influenza – or, in this age of pandemics, perhaps even worse.

But a new innovation from Trelleborg Industrial Solutions is designed to protect us from this ever-present risk of infection. AMV Shield is an antimicrobial system for polyurethane materials that has antiviral, antibacterial, anti-fungal and anti-mold properties. It uses specially prepared silver



How it works

Dr Adam Nevin, says: "The polymer uses silver and iron particles in the mix. Of course, silver has been around for millennia as a material that preserves things. The ancient Egyptians used silver platters to preserve their food.

"By taking the silver and functionalizing the surface of it, it bonds well with the polymer matrix. You can't just mill up some silver into a powder and mix it at home. The surface of the microparticles must be functionalized, so that when they're mixed into a polymer, they're still accessible.

"Some of the silver is exposed to the outer surface and air at all times, and that's what gives the material its antimicrobial and antibacterial property where you touch. It interacts with the microbe membrane and deactivates it."

particles to embed antimicrobial nano particles into the very fabric of polyurethane materials, actively fighting off bacteria and viruses. It's effective against a whole range of bacteria, including E. coli, MRSA, salmonella and listeria.

"There are other antimicrobial materials on the market, but AMV Shield's x-factor is that these particulate materials are incorporated into a polymer," says Dr. Adam Nevin, Innovation Lead at the Retford facility in England where the material is manufactured.

"The particles in the material are uniformly distributed, so no matter how it's formed and what geometry it has, it's safe to touch and handle," he says. "And because the particles are impregnated into the polymer rather than being within a superficial coating, it also lasts much longer – up to 25 years – and the materials don't leach out into the environment, making them suitable for food packaging and distribution."

"AMV Shield's x-factor is that these particulate materials are incorporated into a polymer."

Dr. Adam Nevin, Trelleborg

Left: Public transport is just one of the hot spots for transmission of bacteria.

As we continue dealing with Covid-19, it's clearly a very timely development.

"There's an obvious need for this kind of material, when you consider the amount of surfaces that are touched and the amount of transmission of bacteria that potentially leads to people becoming ill," Nevin says.

"Before the pandemic, we were thinking about how to protect objects like toilet doors, which we all open and close frequently. We considered if people are in a particularly well-used and perhaps less than hygienic place, what kinds of things are they touching? So we came up with the idea of an impregnated polymer material that can cover the likes of a door handle to protect it and people from germs.

"Then, with the Covid-19 outbreak, the development process was accelerated. It's not just 'Wouldn't it be nice to have this?' Now, particularly on public transport, you need some method of preventing transmission of infections."

Trelleborg's agility meant it completed the development process in just a couple of months. Peter Hardy, a Business Development Manager, was quick to see AMV Shield's huge potential.

"I have a background of working with rail original equipment manufacturers, so I immediately thought about all the surfaces on mass transit vehicles and stations. How many times do you try to avoid holding a handle that thousands and thousands of people may have touched?

"AMV Shield can be put into an extrusion, a mold or a stamping, and it can take whatever form is needed. It could go on a door handle, it could be on a touch pad, a coating on a taxi door handle or a grab rail on the London Underground.

"So if we can hit the right market and make people aware of this solution for commonly touched surfaces in mass transit applications, there will definitely be a strong demand," he says.

There has been significant initial interest since AMV Shield's launch late last year. Both Hardy and Nevin say this technology will make a huge impact. Surfaces and products containing foam, such as transport seats, are also in their sights.

"It's one of those simple but highly effective solutions," Nevin says.

"Airport seating areas, mass transit stations, aircraft – the beauty of AMV Shield is that it has the potential for so many applications," Hardy adds. ■

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Protecting the essential

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.