

ttime

A MAGAZINE FROM TRELLEBORG GROUP

1-2021

Solutions that seal, damp and protect critical applications.

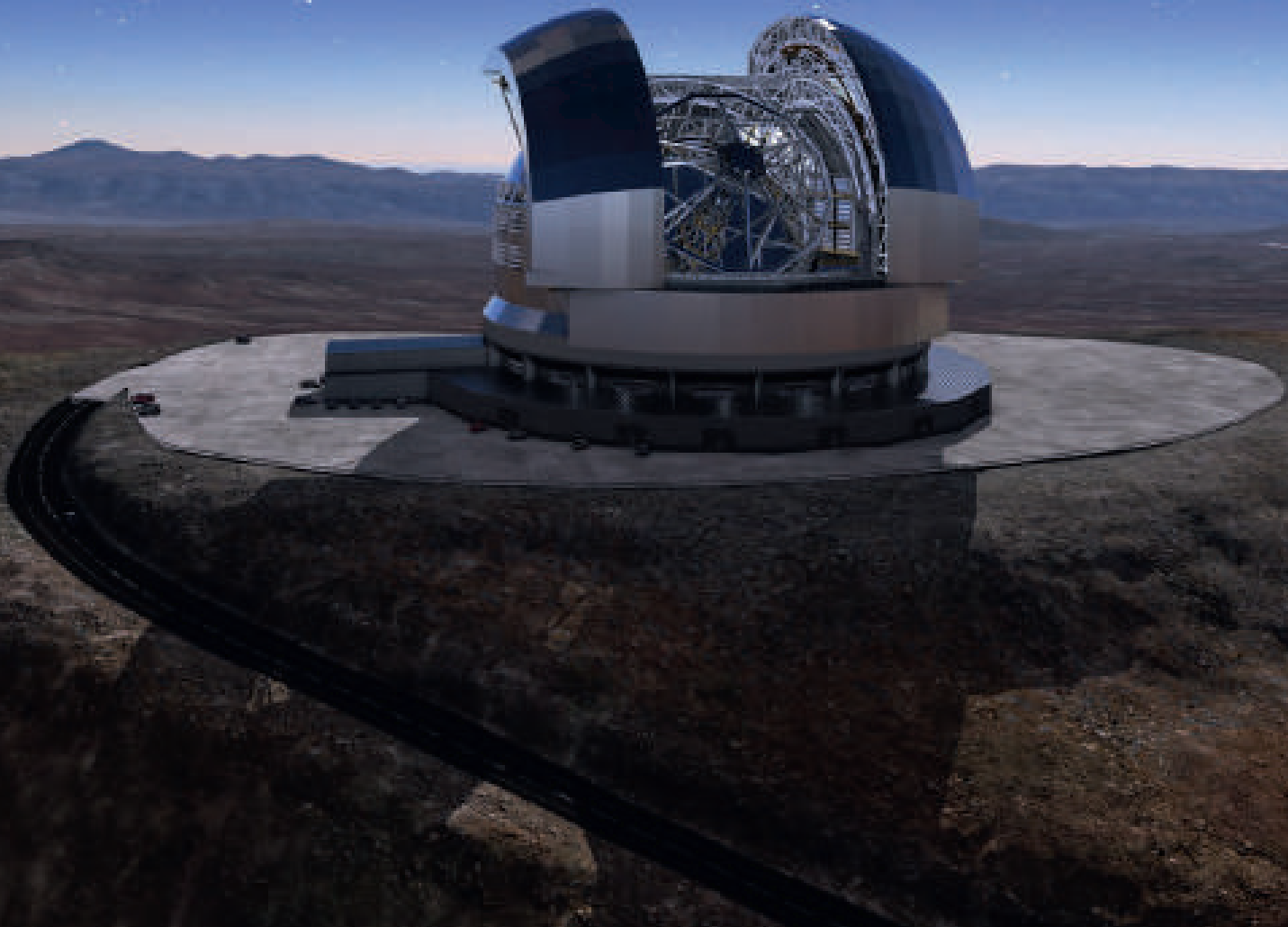
PLUS
KEEPING
WATER FRESH

NET VALUE FOR
THE OCEANS

LIQUID SILICONE
RUBBER TO
THE RESCUE

Reaching for the stars

The largest optical telescope ever built is a stargazer's dream.



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Water management is what motivates Julian West.

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The largest optical telescope ever built will start scanning the heavens in 2025.

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FLUID POWER FOR THE FUTURE

The fluid power industry is growing but there is still the need for direction.



Cover photo:
Extremely Large Telescope (ELT)

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Responsible under Swedish Press Law:
Patrik Romberg,
patrik.romberg@trelleborg.com
Editor-in-Chief: Karin Larsson,
karin.larsson@trelleborg.com
Co-Editor: Donna Guinivan
Production: Appelberg Publishing
Project Manager: Erik Aronsson
Language Coordinator: Kerstin Stenberg
Art Directors: Frida Diaz and Tom Barette
Printing: Trydells Tryckeri
Subscription:
trelleborg.com/en/media/subscription--service
Address: Trelleborg AB (publ)
Box 153, SE-231 22 Trelleborg, Sweden
Tel: +46 (0)410-670 00
Fax: +46 (0)410-427 63

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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, and a reporting segment, Businesses Under Development.

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

www.trelleborg.com


TRELLEBORG

EDITORIAL

PROTECTING THE ESSENTIAL

The climate issue is high on the agenda for Trelleborg and, in this regard, we have spent time identifying effective ways forward. In February 2021, we announced our new climate strategy which addresses the 1.5°C target for society.

The new climate target is called “50 by 25”. In short, we aim to reduce direct and indirect CO₂ emissions (Scope 1 and 2) by 50 per cent related to sales by 2025. Furthermore, our climate vision is to eliminate all emissions from our own operations completely by 2035 – and to continue significant reductions of indirect greenhouse gas (GHG)

emissions along the value chain, (Scope 3).

In this issue of *T-Time* you can read about how Trelleborg's solutions contribute to sustainable development, from space to seabed. Our seals are used in an extremely large telescope and our engineered coated fabrics help to retrieve abandoned ghost nets from the sea.

Peter Nilsson,
President and CEO



Garbage cleanup

Distinctive pink lift bags made by Halcyon Dive Systems retrieve abandoned ghost nets and other plastic waste from the world's oceans. The special fabric for the bags was developed by Trelleborg.

TEXT TRISH RILEY PHOTOS HALCYON DIVE SYSTEMS ►

“We are sometimes surprised by the applications in which our coated fabrics are used.”

Steve Brockman, Trelleborg

Trelleborg materials are renowned for their presence in a huge range of technologies and environments worldwide, but sometimes they can be found in the unlikeliest of places that surprise even Trelleborg itself.

Recently, while watching a television news report about removing plastic waste from the oceans, an employee within Trelleborg Industrial Solutions, noticed something familiar: the bright pink lift bags used for the task contained a polyurethane coated fabric that was produced by Trelleborg.

The bags, made by Trelleborg’s customer Halcyon Dive Systems, are used by Greenpeace and others to remove ‘ghost nets’, fishing nets that have been abandoned to drift in the world’s oceans, causing all manner of havoc to sea life.

“I was very surprised when I saw the bags. I had no idea our coated material was being used to help pull up ghost nets in the ocean,” says Steve Brockman, Vice President & Commercial Director for Trelleborg’s engineered coated fabrics, who is proud that Trelleborg can make a contribution to help address what is a growing problem.

In fact, ghost nets have become a bane of the seas. They are left behind after being caught on coral, dropped by fishermen, or just carelessly discarded because they are worn out. But out of sight does not mean they’re gone. The forgotten nets keep drifting in the water like specters in a haunting dance, continuing to do their job, but helping no one or anything. Fish, crabs, turtles and other sea creatures still

become caught in these nets, slowly perishing due to starvation or strangulation.

The United Nations Environmental Program (UNEP) estimates that 640,000 ghost nets are left behind in the sea each year. That amounts to ten percent of the 14 billion pounds (6.3 billion kilograms) of waste that makes its way into the ocean annually, and it accounts for 85 percent of the plastic that makes up the Great Pacific Garbage Patch.

The Global Ocean Explorers Survey Foundation (GOES) warns that the bits of plastic filling the seas are merging with toxic chemicals from sunscreens, fire retardants (PBDES), polychlorinated biphenyls, tin and mercury, bonding together and being mistaken for food by plankton and other inhabitants of the sea.

These poisonous cocktails have already wiped out an enormous amount of the plankton population on Earth, and GOES says we have only ten years to correct this death spiral. Plankton eat a significant amount of carbon dioxide and produce an astounding 75 percent of the



Dive equipment supplier

Each year, Trelleborg provides about 9,000 yards (8,229 meters) of polyurethane coated nylon fabrics to Halcyon for use in diving equipment, such as the lift bags used to recover lost nets in Ghost Fishing projects. “Trelleborg products are very important to Halcyon,” says Mark Messersmith, COO, Halcyon Dive Systems.

Since 2002, Halcyon has been using products from Lamcotec, a company acquired by Trelleborg in 2018. Based in Monson, Massachusetts, in the US, it specializes in engineered polyurethane coated fabrics for, among others, life-saving equipment, such as diving gear.



Ghost Nets

Ghost nets are commercial fishing nets, some the size of football pitches, which have been lost or abandoned by a fishing vessel and remain in the sea, continuing to catch and kill fish as well as other forms of marine life.

Until the middle of the twentieth century, most commercial fishing nets were made with natural fibers that rotted quickly if lost at sea. However, from the early 1960s, synthetic material such as nylon was used. This is not naturally biodegradable and can last in the ocean for up to 600 years.

It is estimated that more than 100,000 whales, dolphins, seals and turtles become caught in abandoned ghost gear each year. Alternative nets are being developed, which will be manufactured from biodegradable monofilament.

oxygen generated on Earth. That's more than the Amazon rainforest. If all the planet's plankton are killed off, it spells doom for life on Earth.

"There's an incredible amount of plastic out there – wherever you look, wherever you go, you'll find plastic, even in the Arctic," says Mark Messersmith, Chief Operating Officer of Halcyon Dive Systems. For many years, Halcyon has been providing equipment like the dive bags a Trelleborg employee spotted in the news report to Ghost Fishing teams, who work around the world to dredge discarded nylon nets from the sea.

The firm sponsors conservation efforts in Europe and Central America, providing lift bags and diving equipment. Divers attach the bags to debris, then inflate them with their air tanks to lift them off the ocean floor. Messersmith says it can be a tedious and risky business. "There are many small animals

living on the nets and you don't want to cause further damage. It can become dangerous and takes skill."

The company is located in northern Florida in the US, in the heart of an underground paradise for technical divers, who are daring enough to explore the water-filled cave network that holds the freshwater supporting the surfside communities, including Florida's famous Ginnie and Wakulla freshwater springs, which are respectively 75 and 300 feet deep. Halcyon evolved from the specialized needs of these divers.

Nowadays, Halcyon distributes its diving gear around the world.

"We've built a good team and we have a great product. Our reach through the diving community is pretty much unparalleled," says Messersmith.

As well as its supply of dive bags worldwide, Halcyon is committed to

Above:

Bags are attached to debris and inflated to lift them to the surface.

other conservation projects.

It runs Global Underwater Explorers, a specialized dive training agency that is world-renowned, and Project Baseline, a non-profit organization. The latter is dedicated to documenting water bodies to build databases that will establish a baseline to allow for objective scientific evaluation in the future.

"Conservation has always been of interest to us; it's who we are. Science and communities of people working together can change the trajectory," says Messersmith.

He adds that Halcyon has streamlined its packaging and supply lines to utilize recycled, biodegradable, environmentally friendly materials as often as possible. The company even powers its facility with solar energy. "We're not kidding when we say we're making an impact." ■

For more information:

steve.brockman@trelleborg.com

EXPERTISE JULIAN WEST





Underground innovation

After 35 years on the job, Julian West still enjoys every bit of it. And it doesn't bother him that all his hard work is buried underground. As product manager for pipe seals at Trelleborg, West is just happy knowing that the water infrastructure underneath our feet is working effectively without anybody noticing.

TEXT SUSANNA WERNERSSON LINDGREN **PHOTOS** KIT OATES ▶

There are no skyscrapers on his CV. Not even a small building, road, railway or other visible infrastructure. Over his entire career, Julian West has worked in polymer, mainly focusing on water engineering. That's because water management is what motivates him.

"It is such a basic and important part of our daily lives," says West. "Being involved in every part of the water cycle – from rain falling out of the clouds to the point where it goes back into the sea – is very satisfying. Unarguably, the seals that we make at Trelleborg, which go between pipes are very small components within water systems, however, they are absolutely critical."

Most people would say that the groundwork that takes place before a building goes up is hardly the most glamorous part of civil engineering. West begs to differ.

"I like the importance of it," he says. That's because rubber seals are essential components to secure the safe transport of fresh water or sewage through the intricate maze of pipework connected to our homes and workplaces.

West explains that different types of pipes require a variety of sealing solutions. Plastic pipeline systems present their challenges, and so do systems made from concrete. Even if these are two competing materials, they both need reliable rubber joints.

Below:
Julian West
at the F P
McCann facility
in Ellistown,
England.



Julian West

Julian West started his career in 1985 as a design and applications engineer for oil and transmission seals at Forsheda, which became part of Trelleborg Group in 2003.

“I was very pleased when we joined Trelleborg, and could benefit from its vast experience,” he says. He has been Product Manager for pipe seals since 2012.

West lives with his family in England, in a small village in the Peak District National Park, between Sheffield and Manchester, where he also has his office.

“I have travelled a lot in my career and have never found anywhere better to raise my family,” he says.



“I meet many clever, like-minded engineers from all over the world that are pretty much focused on the same thing.”

Julian West, Trelleborg

“Concrete is rigid. Once manufactured and cured it doesn’t flex or creep, whereas plastic pipe systems are designed to deform by up to as much as ten percent once a trench is backfilled and compacted. The different characteristics have to be considered when designing joints.”

The sealing process has come a long way from when Julian West began his working life. For years, standard procedure was to add the seal between the pipes at the building site. But now increasingly markets are moving toward integrated offsite solutions.

“The trend is to shift more work from the building site into the safe and controlled environment of the facility, reducing the risk of things going wrong in the trench,” West explains.

“Seals mounted in a facility are

unlikely to be twisted, lost or fitted the wrong way round. We were the first to introduce integrated solutions, and we can see our competitors moving in the same direction. It’s not new, but the construction industry can be a bit conservative when it comes to underground systems.”

West has knowledge of and involvement in every part of the water management industry. His insights are greatly appreciated by water engineers and pipe manufacturers alike. Part of his job is to liaise with pipe machine and mold makers, as well as pipe producers, to achieve the best design practice and end product. He is also a trusted advisor to various committees that set the industry standards, both in the elastomeric seal and concrete pipe and manhole



Different types of pipes require a variety of sealing solutions.

“Our aim is a minimum of 120 years, which fits with our philosophy to make the best seals, not the cheapest.”

Julian West, Trelleborg

industries. He really enjoys that part of his job.

“I meet many clever, like-minded engineers from all over the world that are pretty much focused on the same thing. It’s very rewarding,” he says.

Yes, he admits, the standard joke in these circles is generally: “What’s in the pipeline?” He is happy to answer the question of what the future holds. One of the changes he sees in water infrastructure is an increased interest in asset lifetime when specifying pipes and seals.

“Trelleborg is involved in long-term stress relaxation tests of rubber materials, to estimate how

long it takes for rubber to lose its strength. Our aim is a minimum of 120 years, which fits with our philosophy to make the best seals, not the cheapest.”

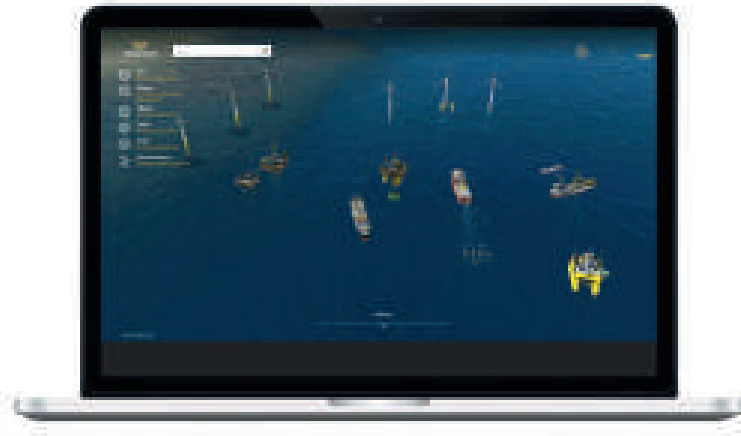
Climate change has an increasing impact on underground water management infrastructure. On a larger scale, the need to address this has ushered in strategies such as sustainable urban drainage systems, with retention systems that hold and release surplus water in a sustainable way. The industry’s efforts to be more sustainable have even seen them copy the very first

European water engineers, the Romans, in adopting their egg-shaped sewers.

“It’s very clever,” says West. “Egg-shaped pipes have better self-cleaning velocities than circular pipes at low flows and therefore they have less risk of blockage. But they still have sufficient capacity for times of heavy rain or flooding. We have actually started to see more egg- and oval-shaped pipes on the market.” ■

For more information:
<https://www.trelleborg.com/en/career>

NEWS



Underwater eye

Managing subsea pipelines relies on effective monitoring to avoid costly repairs, replacement, or even abandonment. Several digital monitoring devices have been developed in recent years, but Trelleborg takes the technology a step further with the Mimir Offshore Interactive Environment (MOIE), part of the Mimir Digital Intelligence hub. The unique 3D tool allows users to navigate around different offshore environments, zooming in and out to explore various oil, gas and renewable applications, in both shallow and deep water.



Junior kick-start

Mitas, part of the Trelleborg Group's portfolio of solutions, is helping to kick-start the careers of junior motocross riders by extending the TERRA FORCE-MX motocross competition tire range to include junior sizes for motorcycles from 50cc to 85cc engine displacements. The tires are available in three different versions, suitable for sandy, soft and hard terrains.



Protecting berths

Trelleborg has supplied SeaGuard foam fenders to Port Canaveral's new 163 million USD Cruise Terminal 3 in Florida, in the US, for the Carnival Cruise Line. The fenders absorb the kinetic energy of vessels, such as the huge Carnival Mardi Gras, when they berth. "Trelleborg's vast experience and track record in supplying high-performance fender solutions to high-profile, demanding projects across the globe, meant that we had no doubt that they would deliver," says project contractor, Tony Landry, President of Rush Marine Construction.



Expansion complete

Trelleborg has completed an expansion of its US healthcare & medical manufacturing facility in Delano, Minnesota. The enlarged facility includes a new 6,000 square foot (557 square meter) ISO Class 7 cleanroom and increased silicone molding capacity. Due to increasing demand for silicone-molded components, Trelleborg has invested in new presses and other silicone molding equipment, including a material mixing station, cleanroom silicone storage, alcohol wash, tumbling machines and a packaging cell.

WILL YOU MARRY ME?

For the perfect proposal, you need the perfect location.

TEXT DONNA GUINIVAN

ILLUSTRATION NILS-PETTER EKWALL

For his marriage proposal, our suitor has chosen a candlelit dinner for two in a high-rise restaurant with a panoramic city view.

A familiar location to many of us, and yet it's hard to believe how many solutions Trelleborg supplies to make this scene possible.

From sealing profiles and bearings that make the building comfortable to be in, to solutions that ensure hygienic and productive processing of food and drink and from blankets for the printing of high quality chocolate boxes, to mining equipment for extraction of the diamond that's in the engagement ring! ■

1. Fish course

In fish farming, hoses are used for the oxygenation of water to optimize fish growth and ensure their welfare.

2. Diamond ring

Wear liners and screening systems are vital components for efficient mining, including of precious stones such as diamonds.

3. High-rise facades

Floor-to-ceiling windows that keep restaurants at a comfortable temperature are made possible with custom sealing profiles.

4. Skyscraper

Composite bearings greatly reduce the

transmission of noise and vibration from any disturbance to a structure such as a skyscraper.

5. Champagne

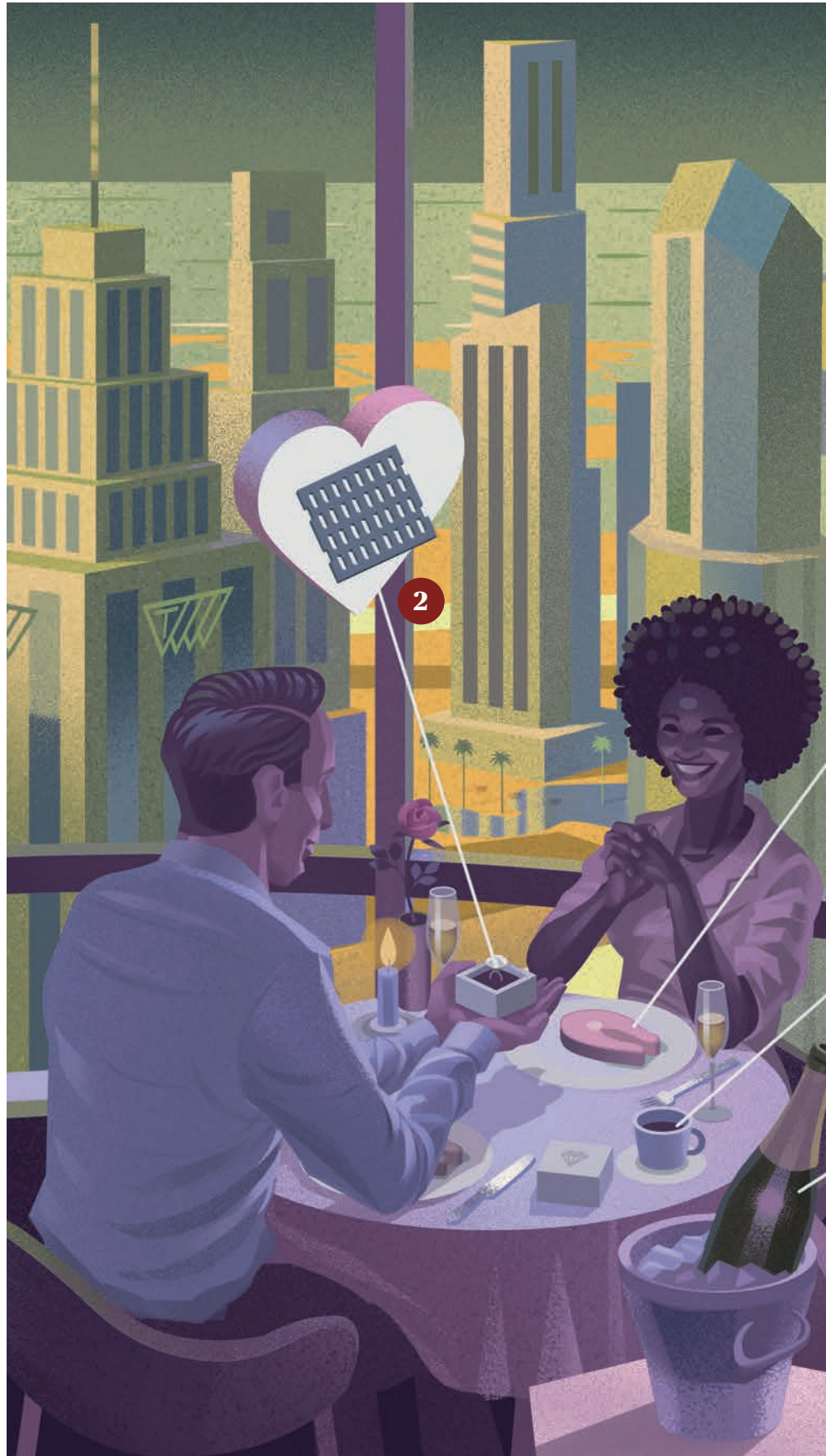
Hoses with outstanding flexibility and easy handling are specially designed to be maneuverable in wineries.

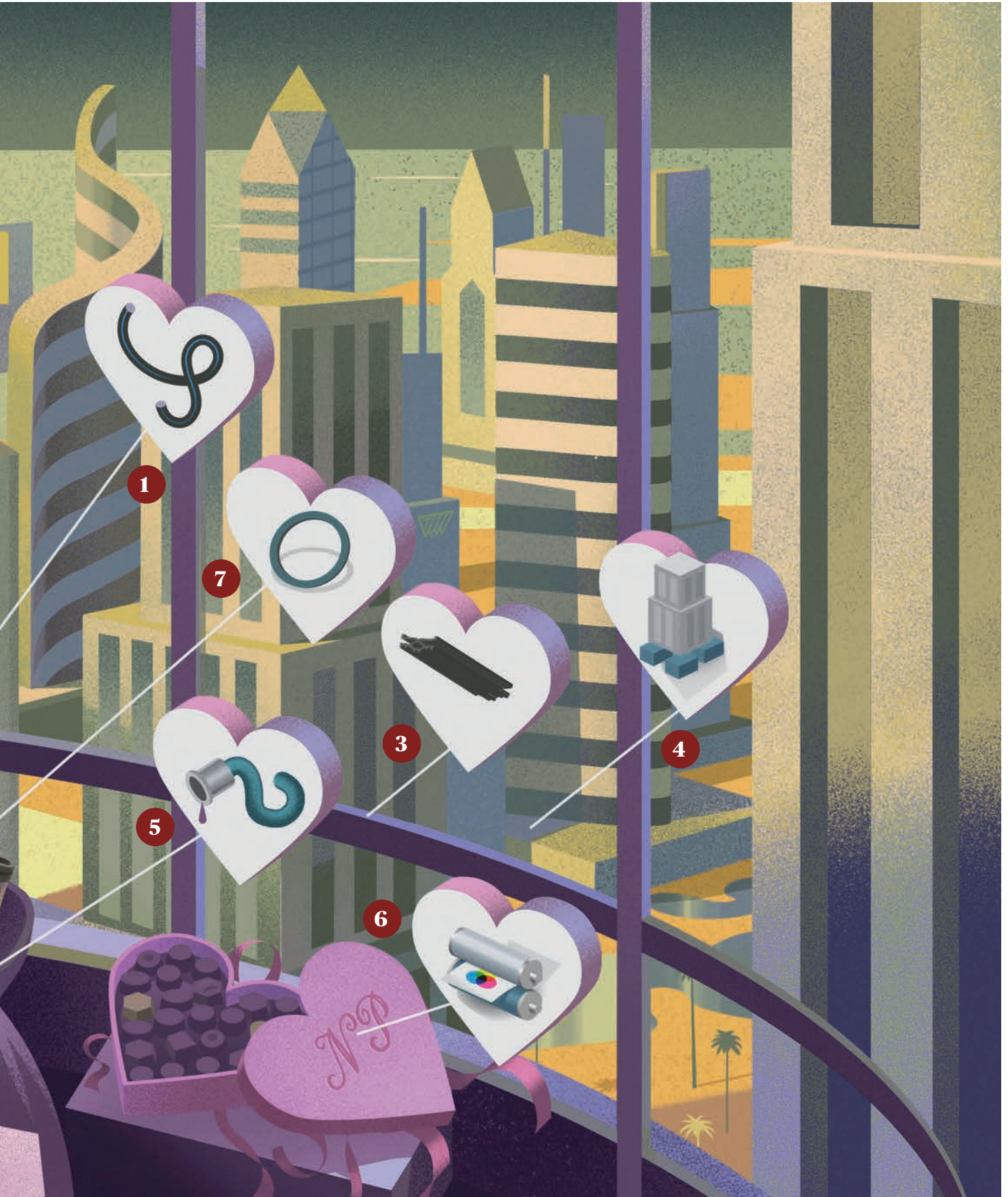
6. Chocolates

High quality packaging is created with printing blankets that give perfect reproduction every time.

7. Beverages

Filling equipment used in beverage processing require seals that meet stringent hygienic standards.





29.2 BILLION USD

In 2019, global sales from chocolate exports totaled 29.2 billion USD.

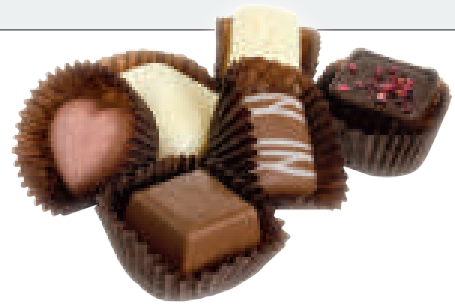


PHOTO: GETTY IMAGES

110 million USD

After the proposal comes the wedding. The most expensive wedding of all time took place in England between Prince Charles, heir to the British throne, and Diana. In 1981, the wedding cost 48 million USD, and in 2020, when adjusted to inflation, that equates to 110 million USD. Princess Diana's dress, which was adorned with 10,000 pearls, was reputed to be worth 150,000 USD. The couple had 27 wedding cakes, the main one of which was five feet tall with a duplicate in case of accident.



6 categories and 11 grades

Diamonds are graded in terms of their blemishes and inclusions. The GIA Diamond Clarity Scale has six categories and 11 grades. The top category is flawless, which means a diamond has no inclusions or blemishes visible under 10x magnification.

15 LITERS

The Nebuchadnezzar, which holds 15 liters, is the largest of all mainstream bottle sizes and provides enough wine to fill 120 Champagne flutes.



PHOTO: PEXELS

+527%

Global fish production is estimated to have reached 179 million tonnes in 2018, with 156 million tonnes ending up on our plates. Most of the growth in production in the fishing sector has been from aquaculture, which saw a rise of 527% from the 1990s to 2018. In addition to being by far the world's major fish producer, China has also been the main exporter of fish and fish products since 2002. From 2004, Norway has been the second major exporter, now followed by Vietnam.

PHOTO: UNSPLASH



301.9 million

Sparkling wine can only be called Champagne if it comes from the region of Champagne in France. In 2019, 301.9 million bottles of champagne were produced by 16,100 wine growers from 360 houses. The biggest export market for champagne is the UK, which bought nearly 27 million bottles in 2019, followed by the US and Japan.

442 meters

Atmosphere is the world's highest restaurant, at 442 meters from the ground. It is on the 122nd floor of the world's highest building, Dubai's Burj Khalifa, and boasts an array of culinary delights with breathtaking views of the Arabian Gulf.



All weather hero

Trelleborg's new EMR1025 tire provides the best possible traction in snow and ice, but its unique properties mean it's a perfect choice all year round.

TEXT ANDREW MONTGOMERY PHOTOS TRELLEBORG





Snowplow operators are the unsung heroes of winter-time. Each year, when snowstorms strike, this brave band head out at all times of the day and night to tackle the worst of the weather and keep our roads clear.

It's a dangerous job, often done in treacherous conditions. The snowplows, loaders and gritters that take to the highways need their machines to have tires with the firmest possible grip and superior braking capability, or they could end up stuck in a ditch at the side of the road.

Of course, there are plenty of winter tires on the market to provide the grip that the operators' machines need for icy or

snowy weather, but these tires also have their down sides.

The first thing is that the harder grip of snow tires means they can damage asphalt roads. Snow usually comes and goes over the winter months, so as soon as it disappears, these tires may start churning up tarmac.

Secondly, as winter tires are made of softer rubber, they tend to wear out more quickly than regular tires. Using winter tires in normal conditions can shorten tread life, and it can be an expensive business to keep replacing tires.

In addition, snow tires are generally not designed for precise handling. There's definitely an art to driving with them on

a vehicle; as snowplow drivers and other experienced winter drivers will confirm.

With all this in mind, plus the hassle of having to change tires twice a year at the beginning and end of every winter, surely all-season tires are the solution? Well yes, except that most all-season tires are made for less harsh conditions, so they are not generally effective in ice or snow.

But Trelleborg has the answer to the snow heroes' prayers.

Last winter, the company released the EMR 1025, an all-season commercial tire designed for loaders and graders, that combines an enhanced grip on snow and ice with damage protection and durability, making it suitable for all year round use.

“The success of this product shows how well we work together globally.”

Alessio Bucci, Trelleborg

The EMR 1025 is the product of intensive R&D, as Alessio Bucci, Product Marketing Senior Manager at Trelleborg Wheel Systems, explains: “The development process was a collaboration, involving Trelleborg’s R&D and product marketing for tires in both Italy and the Czech Republic. The success of this product shows how well we work together globally.”

While the initial product launch at the 2019 Bauma trade exhibition focused on the winter tires aspect, there was a twist in the tale. Alessio Bucci says that Trelleborg soon found that the tire had all-weather potential.

“The EMR 1025 tire was developed specifically to ensure that operators performing tough jobs, such as snowplowing, have the best grip and traction on ice and snow. This not only enhances productivity, but also makes it easier and safer for operators to do their jobs. What could be more important than that?

“But in addition, based on all-year-round positive feedback, EMR 1025 proved to be an all-season tire. Considering this, we extended the 14.00R24 and 17.5R25 range by introducing the 20.5R25 and 23.5R25 sizes in 2020. This means that customers



Above:
The EMR 1025 tire.

won’t have the additional cost associated with seasonal changeovers.”

The tire’s secret lies with its siping (the process of cutting thin slits across the surface to give it a perfect winter tread pattern), and its state-of-the-art rubber compound. These allow the tire to deliver both higher traction on snowy or icy surfaces, and reduced braking distance, so that operators and machines achieve the best possible protection without compromising performance on dry surfaces.

It’s the ideal solution for municipalities and airports, especially in parts of the world where heavy snow can suddenly fall. If this occurs, the EMR 1025 means that operators and their machines don’t need to waste time changing tires, so they are ready to provide snowplowing at a moment’s notice.

“So far, we have received positive feedback on the tire’s performance, in particular with regards to the high traction it offers on snow, as well as the tire’s wear resistance in dry conditions,” says Bucci.

Winter’s coming...but the Trelleborg EMR 1025 is more than ready for it. ■

For more information:
alessio.bucci@trelleborg.com

A TIRE FOR ALL SEASONS

- The EMR 1025 tire is available in four sizes: 14.00R24, 17.5R25, 20.5R25 and 23.5R25.
- It has a radial all-steel construction, reinforced carcass, and multi-surface tread pattern, offering excellent ride comfort.
- Other benefits include reduced operating costs, increased uptime and more safety through reducing uncontrolled braking.



**EXCELLENT
RIDE COMFORT**



**MULTI
SURFACE**



**REINFORCED
CARCASS**



**RADIAL
CONSTRUCTION**

Useful predictions

TEXT DONNA GUINIVAN PHOTOS TRELLEBORG

The Internet of Things, Big Data, Artificial Intelligence and Predictive Maintenance are words frequently used in manufacturing today. Are they just buzz words? Can real benefits be gained by introducing digitization into products? Trelleborg's Johannes Kunze von Bischhoffshausen passionately believes that there are tangible advantages to digital transformation in product design and processes.



What if you could predict when a piece of equipment was going to fail? At home, few of us can cope with the downtime involved when a washing machine breaks down. At some time in its life it will, but wouldn't it be great to know when?

Machines in production environments also break down, especially when they are in use 24/7. To manufacturers, that does not mean a heap of dirty washing, but rather the cost of lost processing time and income.

"Maintenance is an important area of focus for manufacturers," says Dr. Johannes Kunze who is manager of digital transformation for Trelleborg Sealing Solutions. "It's vital for process efficiency and it's also an area where the introduction of digital technology can minimize downtime and reduce total cost of ownership, two goals at the forefront of any manufacturer's mind." The most basic maintenance strategy is corrective maintenance; simply fixing something when it breaks. Kunze says this is OK in non-critical applications but not a good solution if downtime is costly.

"In more critical applications, it is important that preventative maintenance is undertaken before a machine breakdown. Typically, this involves fixed planned maintenance cycles based on usage or time, but

without digital technology. This can be wasteful if components are replaced before it is necessary."

One step further is condition-based maintenance, where sensors are added to machines to capture a prescribed condition indicating seal wear, and when a threshold is reached, that replacement is required.

Although this involves digital monitoring, it is still a stage away from full predictive maintenance, which aims to optimize maintenance time by forecasting the useful life of a component or when a component is going to fail. This is seen as one of the big value drivers of digitization and according to the McKinsey Global Institute report, *The Internet of Things: Mapping the Value Beyond the Hype*, it is estimated that IoT use cases such as predictive maintenance, could help companies save 630 billion USD by 2025.

Kunze adds that: "Real intelligence is achieved by making use of the sensors' signals and predicting by means of statistics or Artificial Intelligence (AI) what is going to happen within a system and when a part is potentially going to fail, with scheduling maintenance based on this.

"For companies that are using the Internet of Things (IoT) and AI in their products and its systems, putting sensors in, capturing the data and analyzing it, is not the challenge. The real challenge is to make sense of the data and act upon it."

Good predictive maintenance depends on identifying suitable

measurements to predict outages of a system.

"Talking to technicians, they will often say that they know when a system is going to fail by the noise it makes," continues Kunze. "This is a good indicator to measure, along with other common measures, such as external temperature and vibration. However, these obvious indicators occur close to when the machine is going to fail, which is generally too late to prevent downtime."

Sensors are increasingly used in equipment today, measuring everything from vibration, humidity, ambient temperature, to acoustic signals, motor current, insulation resistance, electrical capacitance and electrical inductance. Some even utilize thermography to create heat maps to capture what is happening inside equipment. One sensor will not generally indicate failure and data from a combination of sensors is usually required. Kunze, says: "To train a model or algorithm for digitally driven predictive maintenance, sensor data needs to be combined with good data from the field and reference data. It is necessary to find the hidden patterns, the relationship of pressures or rotational speed between breakdowns, for instance.

"One data source can be technician reports, which detail when a machine failed and what components were changed. The sensor data then needs to be split into data when the machine was operating correctly and when it was in failure mode,

Left:

Trelleborg is carrying out several Cognitive Sealing projects.

“IoT requires intelligent machines, advanced analytics and critically, people.”

Dr. Johannes Kunze, Trelleborg

then integrating this engineering knowledge into preprocessing.”

It’s clear from this that predictive maintenance is not all about statistics for statistics sake. Using sensor data to create potentially meaningful indicators requires deep knowledge of specific applications and requires collaboration between engineers and data scientists to develop failure models.

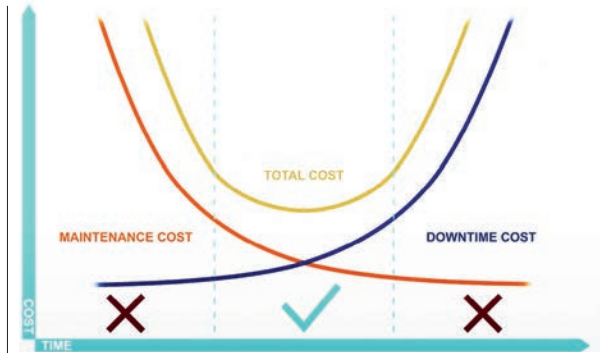
“IoT will not result in the replacement of humans by robots, causing the technician or engineer to become superfluous,” confirms Kunze. “IoT requires intelligent machines, advanced analytics and critically, people.

“We’re beginning to see ever more intelligent machines, which have sensors and internet connectivity, allowing them to transmit data. People are required to make decisions, but with true predictive

maintenance, these decisions are based on advanced analytics of the data that is gleaned from these intelligent machines.

“Without IoT, engineers could not possibly decipher data from up to 50 sensors, found in some of the latest manufacturing machines. Data scientists develop algorithms to find patterns and relationships within the data from these sensors and other data sources. The output from this process is more meaningful than the raw data. People then form decisions based on these actionable insights, making their work easier and significantly more effective.”

At Trelleborg Sealing Solutions, the overall approach to predictive maintenance is called Cognitive Sealing. Typically, predictive maintenance focuses on areas where there is a high cost related to downtime and maintenance. There are



The sweet spot of predictive maintenance.

currently several ongoing Cognitive Sealing projects.

“One example is our three-way partnership with Vapo Hydraulics and Ampelmann Operations. This shows how big data can work to develop next generation solutions,” says Kunze. “We see this as the way we will work in the future. By helping improve our customers’ products and their customers’ products, as well as lowering their total cost of ownership, we hope to cement our relationships through our high value contribution.” ■

For more information:
johannes.kunze@trelleborg.com



PHOTO: AMPELMANN

A three-way partnership

Ampelmann produces solutions for the safe transfer of people and cargo to offshore structures that incorporate gangways utilizing cylinders from Vapo Hydraulics.

A project was undertaken with these two companies and Trelleborg to collect and analyze sensor data from the hydraulics operating the gangways to predict certain failure modes, with the aim of avoiding the significant cost associated with unplanned downtime.

“In terms of results so far, we have some good first algorithms that need to be statistically proven, as well as some key sensor data that was missing from the data sets,” says Jochem Pieterse, Head of Reliability at Ampelmann Operations, says. “These can now be added to new cylinders to give a more comprehensive field of data sets.”

“Three-way open communication gave us all a chance to bring our experts to the table to create and stimulate us to move to the next level of root cause analysis,” says, Wouter Vullers, Commercial Director at Vapo Hydraulics NV. “For our company, this helps us to develop new products and update existing ones, so we can support the customer to produce a better product in the future.”

What the doctor ordered

TEXT ANDREW MONTGOMERY PHOTOS TRELLEBORG



Liquid Silicone Rubber is a stable and adaptable material that's accelerating innovations in medical device design, making devices more robust, efficient, and adaptable to patients' needs.

Today's medical device manufacturers operate in a challenging landscape. Stricter regulations, for example, the need for biocompatibility, are making development and manufacturing more demanding. Add to that, user requirements for devices that suit their lifestyle choices, such as wearable devices and home monitoring, and you can understand why engineers are looking for novel component options.

One solution is Liquid Silicone Rubber (LSR) molding and multi-component manufacturing.

"Silicone is ideal for medical

devices and equipment, not only because it's inert, biostable and biocompatible, but also because it can be processed in many ways, including molding," explains Andrew Gaillard, Global Director for healthcare & medical at Trelleborg Sealing Solutions. "It can be molded on its own, but where the real magic happens, is when it is combined during the molding process with engineered plastics and other substrates, in what is termed multi-component manufacturing."

This technology produces a single component, instead of separate parts that need to be assembled together.

PROTECTING THE ESSENTIAL MEDICAL DEVICES

This has several advantages for the medical device manufacturer. It cuts their production costs and the supply chain cost associated with stocking and handling multiple parts. The single integrated device has greater integrity and removes undesirable spaces where bacteria can grow; negating the risk of contamination.

“For new multicomponent LSR applications, it is important to involve the component manufacturer as early as possible in the development process; ideally from the concept stage,” says Gaillard. “Some molders, such as us, take a black box approach in which the designer specifies what is wanted for the function and performance of the component, along with the available design window. The molder then develops a proposal that has



Below:

In an ISO Class 7 cleanroom, only 352,000 particles of 0.5 micrometer or larger are permitted per m³ of space.

all the benefits of LSR processing.”

The LSR molding process is well-suited for miniature parts. The process can produce micro and nano-sized components below 10 milligrams in weight through needle-point injection technology. One of the smallest pieces manufactured by LSR molding is a septum, the membrane in the cap of a medicine bottle through which a syringe is inserted and withdrawn. This typically weighs just 0.003 gram.

“At that size, you can hardly pick the part up, and the standard molding burrs are larger than the part itself,” says Gaillard.

Manufacturing a micro-component such as this requires extreme accuracy in tool construction, control of shot weight and the molding process. Automatic handling of the product after mold-

ing is performed by a specially developed robot gripper arm. The process keeps things reliable and accurate for millions of shots.

“The example of the septum shows that automation is critical for medical device component manufacture. This makes the high-volume production of extremely complex multicomponent LSR geometries possible. Automation can also ensure cleanliness requirements are met as the production process is free of the risk of contamination,” says Gaillard.

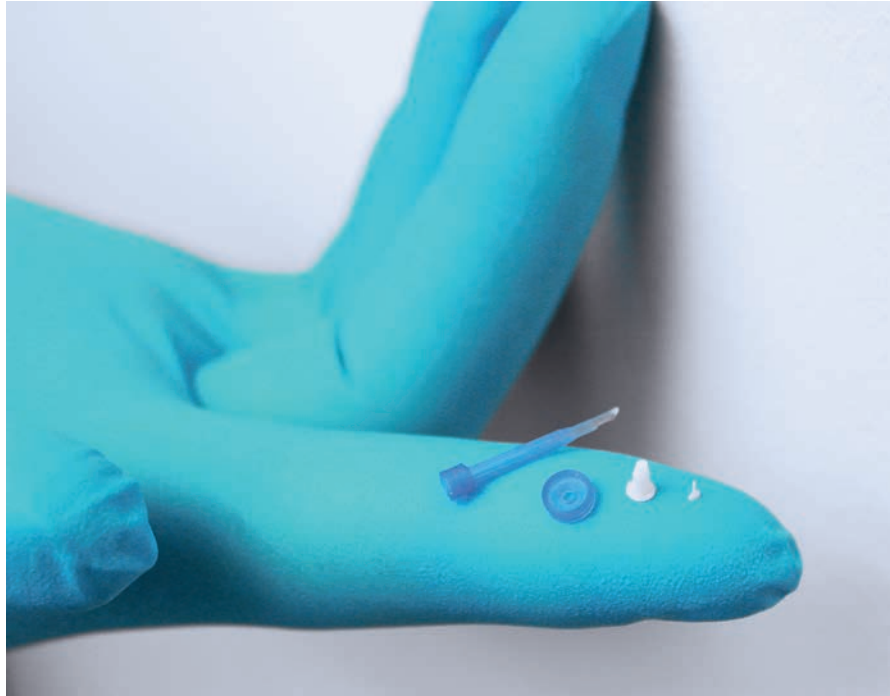
Quality is paramount for medical devices. According to Gaillard, the “holy grail” here is to ensure quality in process rather than to conduct post-production quality checks. Thus, certified quality systems and process controls are built into the production process.





“Silicone is ideal for medical devices and equipment, not only because it’s inert, biostable and biocompatible, but also because it can be processed in many ways, including molding.”

Andrew Gaillard, Trelleborg



The ability to segregate suspect products effectively with minimal disruption is crucial to minimizing downtime in a high-volume, rapid production process. Ideally, in-line quality checks should be electronically recorded to allow full traceability. Any issue can therefore be isolated to just a small number of components.

Though standards vary, cleanliness in medical device manufacturing is always vital. For some medical devices, production in an ‘uncontrolled environment’ is clean enough. However, due to the nature and positioning of LSR moldings within a medical device, they may need to be manufactured and packed in a fully ‘controlled’ cleanroom of class 100,000, ISO 8 or class 10,000, ISO 7.

Though they’re not generally a sterile environment, cleanrooms control a specified number of particles per cubic meter, at a maximum specified particle size. This includes environmental pollutants, such as dust, airborne microbes, aerosol particles and chemical vapors.

“The ambient air in a typical urban environment contains 35 million particles per cubic meter

of a diameter of 0.5 micrometer or larger. This in comparison to an ISO Class 7 cleanroom in operation, where only 352,000 particles of size 0.5 micrometer and larger are permissible per cubic meter of space,” explains Gaillard.

Current applications for LSR technologies range from drug delivery, such as primary drug packaging or wearable smart drug pump systems, to fluid management,

diagnostics, and biotechnology.

With so many advantages, it’s no surprise that LSR technology is seeing exponential growth. And in this emerging niche market, it’s Trelleborg that is the world’s leading exponent of precision LSR molding and multicomponent technology for medical devices. ■

For more information:
andrew.gaillard@trelleborg.com

Case story: Patient benefits

When a customer’s medical valve was leaking and generating too much friction, a multicomponent LSR solution was the answer.

The control valve was made up of three separate parts – a piston sealed with two silicone O-Rings. But Finite Element Analysis (FEA) simulations found that the plastic piston was misaligned, causing the leak. High friction between mating surfaces and assembled O-Rings was a second concern.

A new valve was developed using multicomponent technology, consisting of a single component with compressive inner sealing that was pressurized on both sides. It also had

deflective outer sealing to reduce friction, creating a pressure-energized seal. The new design was subjected to FEA simulations and a Design for Manufacturing analysis, including material flow simulation, to ensure manufacturing feasibility and to prove the intended tool concept.

The new LSR part was a reliable solution to leakage and friction issues. The integration of three individual components into one, streamlined the manufacturer’s supply chain and production process, increasing the company’s product quality and reliability, while also reducing production risk and overall costs.

Stargazing

Is there anybody out there? Maybe we'll find the answer to that eternal question when the largest optical telescope ever built, featuring Trelleborg's advanced sealing systems, starts scanning the heavens in 2025.

TEXT ANDREW MONTGOMERY **PHOTOS** ELT & UNSPLASH

It's a stargazer's dream come true: the world's largest 'optical/near-infrared extremely large telescope' is slowly but surely taking shape on a mountain top in Chile's Atacama Desert.

Upon its completion in 2025, the Extremely Large Telescope (ELT), part of the European Southern Observatory, will gather and focus 13 times more light than today's largest optical telescopes.

It will also boast a 39-meter primary mirror and groundbreaking adaptive optics technology that will help correct the distortions in the Earth's atmosphere, making the images more defined than those taken from space. In fact, the pictures that ELT captures will be 16 times sharper than those from the Hubble Space Telescope. It's a game changer for astronomers.

The project was born in 2010 but 'first light' (the first use of the telescope to take an astronomical image after it has been constructed) is planned for 2025. The telescope, an observatory when the surrounding support structure is factored in, will tackle some of the biggest scientific challenges of our time, including studying Earth-like planets around other stars in the "habitable zones" where life could exist – one of the holy grails of modern astronomy.

"The ELT will facilitate the advancement of astrophysical knowledge by enabling more detailed studies of planets around



PHOTO: TRELLEBORG

Above: The ELT is built in Chile's Atacama Desert.

other stars, the first galaxies in the Universe, black holes, and the Universe's dark sector," explains Michele Giuliani, from Cimolai, the company that is responsible for the ELT's construction.

When complete the gigantic construction will sit on the summit of Cerro Armazones mountain, 3,000 meters above sea level. This part of the Andes range is surrounded by the Atacama Desert, the driest non-polar desert on Earth, so the equipment will have to cope with very demanding conditions.

That's where Trelleborg comes in. The company will manufacture and supply highly durable, hand-made inflatable and compression seals, which will keep the ELT's

“It is vital that the construction of the ELT utilizes true industry-leading solutions.”

Michele Giuliani, Cimolai

classic dome-shaped enclosure pressurized, airtight from water, heat and dust, and ensure there is no ultraviolet light exposure within the enclosure.

“It is vital that the construction of the ELT utilizes true industry-leading solutions,” says Giuliani.

“Trelleborg’s unrivaled reputation and technical qualification meant the company was a natural choice to supply the project.”

Like all those working on this prestigious assignment, Trelleborg is delighted and proud to be involved.

Andre de Graaf, Sales Director for infrastructure projects within

Trelleborg Industrial Solutions, says, “The ELT is a revolutionary scientific project that will address many of the most pressing unsolved questions about our Universe.

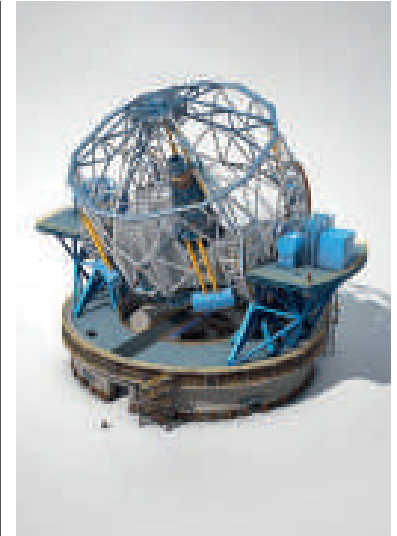
“Therefore, for our solutions to be specified is an impressive feat that is testament to our ability to design, manufacture and test bespoke sealing systems that provide impenetrable protection for up to 25 years in even the harshest of environments.”

So, is there life on Mars? Watch this space. ■

For more information:
andre.de.graaf@trelleborg.com



Andre de Graaf,
Sales Director,
Trelleborg.



A sketch of the ELT's structure.

The world's biggest eye on the sky

- **The ELT** has a steel structure that is 71 meters in diameter and 62 meters high. It will be equipped with sliding doors and positioned within a rotating steel structure, called “the dome”, 92 meters in diameter and 80 meters high.
- **The diameter** of the telescope’s ‘eye’ will be almost half the length of a soccer pitch.
- **The main mirror** will be made from 798 hexagonal segments.
- **The European** Southern Observatory chose Chile’s Cerro Armazones mountain as the site for the ELT because, like the nearby Paranal observatory, it has over 320 clear nights a year.
- **ESO, the** European Southern Observatory, is the foremost inter-governmental astronomy organization in Europe. It is supported by 16 countries: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Poland, Portugal, Spain, Sweden, Switzerland and the United Kingdom.



NEWS



PHOTO: THULE GROUP

New patented method of extrusion

Thule Group, a market-leading producer of products such as roof racks, roof boxes and bicycle racks for cars, turned to Trelleborg for help with the design of a more aerodynamic rubber strip for a new generation of roof racks, later named Thule WingBar Evo.

The purpose of the new product was to offer both a simpler solution for mounting accessories and a design that lowers aerodynamic drag in order to reduce noise and fuel consumption. The solution became a new method of extrusion for which a patent application has been published.

Howdy, partner

AGCO, one of the world's largest manufacturers of agricultural machinery and equipment, awarded Trelleborg Sealing Solutions partner-level priority supplier status at its first EME Virtual Supplier Event.

AGCO's brands include Challenger, Fendt, GSI, Massey Ferguson and Valtra. Trelleborg Sealing Solutions supplies AGCO with special rotary seals for applications including transmissions and tire pressure control systems. Trelleborg's customized sealing solutions and assemblies have helped give AGCO a unique selling point in the agricultural equipment market.

It's the second such award from AGCO for Trelleborg Group – Trelleborg Wheel Systems attained partner status in 2018.



PHOTO: AGCO

30% longer lasting

Research studies by Trelleborg show that its new PS1000 material handling forklift tire lasts up to 30% longer than other tires on the market. The PS1000 incorporates the Pit Stop Line innovation, specialized compounds and a new design to guarantee uptime, efficiency and safety for operators.



Going for gold

Several hundred square meters of 12 mm thick Trelleborg "GoldLine" premium natural rubber line large bore steel piping at a gold processing plant in Western Australia. There it acts as a highly durable, wear-resistant barrier, protecting pipes from slurry abrasion.

Eric Lanke

Eric Lanke is the President and CEO of the National Fluid Power Association, a trade association of more than 340 organizations serving the hydraulic and pneumatic industries. He is responsible for setting NFPA's strategic direction, and overseeing the programs and communications needed to achieve its objectives. He also serves as the President and CEO of the NFPA Education and Technology Foundation, an affiliated charitable organization that supports outreach, education and research programs in fluid power.



A fluid roadmap

In 2019, the National Fluid Power Association published its latest technology roadmap. Eric Lanke, President and CEO of the NFPA, explains what it means for the fluid power industry and its members, which include Trelleborg.

TEXT MIKE O'BRIEN PHOTO SARA STATHAS

In recent years the fluid power industry has been enjoying a sustained period of growth, buoyed by urbanization, the continuing development of industrial production, increasing construction activities and higher demand for automobiles.

But there is still the need for direction, which is why the Technology Roadmaps published by the US-based National Fluid Power Association (NFPA) have been so important since they were first issued in 2009.

Eric Lanke, President and CEO of the NFPA, explains the strategic value of the roadmap concept.

“Our Technology Roadmap is intended to identify the research and development objectives that the fluid power industry should pursue to help ensure that its products continue to meet the needs of its diverse customer base.

“An update is published every other year and, since its inception, we have dramatically increased the number of customer voices that are part of the roadmap’s development process. Today’s roadmap is much more focused on the actual needs expressed by those customers.”

The fourth and latest iteration of the roadmap,

Improving the Design, Manufacture and Function of Fluid Power Components and Systems, arrived in 2019. It came amid a period of healthy progress for the industry, and Eric Lanke is optimistic about several aspects.

“The 2019 Roadmap shows strong alignment between fluid power and many of the primary needs of our customers,” he says.

“For example, when looking for technologies that can help increase productivity or performance, lower the capital or operating costs, or increase the power density of machines, customers frequently choose fluid power as a primary technology.”

Among the analysis carried out by the committee responsible for the Technology Roadmap is the identification of eight ‘Customer Drivers’ – the ranking of what they see as being customers’ main needs.

Here the 2019 roadmap contained a couple of surprises: autonomous operation and greater integration of technology are two areas that were given relatively low importance, despite the growing significance of Internet of Things (IoT) in many markets.



About the NFPA

Founded in 1953, the National Fluid Power Association (NFPA) focuses exclusively on fluid power technology with members representing the entire fluid power supply chain. Headquartered in Milwaukee, Wisconsin in the US, the NFPA began with 35 fluid power companies at the inaugural meeting on May 1, 1953. Its membership has now grown to over 340 companies with an ever-increasing impact toward ensuring fluid power is a customer's technology of choice.

The NFPA and Trelleborg Sealing Solutions

As a Supplier Member of the NFPA, Trelleborg Sealing Solutions donates to the organization's PASCAL society and actively participates in several committees, including the:

- Supplier Leadership Council
- Future Leaders
- Education Committee
- FAMTEM hubs
- Fluid Power Challenge

<https://www.nfpa.com/home/About-NFPA.htm>

“The preeminent concerns remain the needs for machines to deliver increased availability and uptime, increased productivity and performance, and lower capital and operating costs.”

Eric Lanke,
President & CEO, National Fluid Power Association

“The eight drivers cited are the eight most important things that fluid power customers are trying to deliver to their own customers – the buyers of their machines,” explains Eric Lanke.

“And while IoT is clearly making dramatic inroads into the marketplace, the preeminent concerns remain the needs for machines to deliver increased availability and uptime, increased productivity and performance, and lower capital and operating costs.”

However, that does not mean that the NFPA is dismissive of the potential of IoT. Not at all, says Lanke.

“I think it is interesting to note that IoT, while obviously a technology that can facilitate autonomous operation and the greater integration of technologies, can also be applied to the more ‘bread and butter’ concerns of uptime, performance, and cost. It is similar to things discussed in many of our road mapping sessions – the Internet of Things is not a Customer Driver in and of itself. IoT is a technological strategy for addressing the needs expressed by many of the Customer Drivers.”

The roadmap also includes a gap analysis that compares the importance of Customer Drivers and fluid power's ability to meet the need expressed by that driver. Sometimes, as with weight reduction and increased power density, the fluid power industry can meet a need that exceeds its importance to customers.

Conversely, Eric Lanke says that the roadmap also identifies some significant unmet needs.

“The largest gaps between Customer Drivers and fluid power's current ability to meet them were in relation to the autonomous operation of, and the integration of technologies on the customer's machines.”

In response to this, the Technology Roadmap



also makes several recommendations to the industry, including improving the ability of fluid power to monitor, gather and use data from its own systems in ways that add value for customers. NFPA has been highlighting the latest innovations in this specific area at a series of regional conferences and via its new podcast, *Fluid Power Forum*.

The roadmap sees electrification as one of the ways to improve fluid power control systems, which is a key ‘Capability Improvement’ that was highlighted in the plan.

Here, Eric Lanke points out that industrial hydraulic systems have always been electrified, as they generally have an electric motor at their core. In fact, this improvement is about responding to environmental imperatives. This means electrifying mobile machines through either replacing the internal combustion engine with an electric motor for the machine's propulsion – while keeping hydraulics for its actuated work functions – or replacing both the internal



combustion engine and the hydraulic system for entirely electro-mechanical solutions.

“This Capability Improvement incorporates the research and development needs associated with this and other changing environments. Most notably, it focuses on the development of novel control architectures and algorithms that will allow hydraulics to flourish in this evolving hybridization of technologies on mobile machines,” says Lanke.

The rapid changes stemming from the likes of electrification and digitalization, and societal pressures such as climate change and urbanization, mean that it’s hard to identify exactly what will be in the next roadmap, which is due in 2021. However, Eric Lanke says the NFPA is already focusing on one area of development.

“We would like to include even more customers in the road mapping process. Those who participated in developing the current roadmap were pivotal in creating a document with a lot of utility, both for them, and for their fluid power suppliers.” ■

The National Fluid Power Association, headquartered in Milwaukee, Wisconsin in the US, is a trade association for the hydraulic and pneumatic industries.

Leader in hydraulic sealing

Trelleborg Sealing Solutions is a leading developer, manufacturer and supplier of seals for hydraulic systems, which are used in everything from tractors and off-road vehicles, to aircraft landing gear and prosthetic knees.

Involved in design of fluid power sealing configurations for over 60 years, the company is the innovator of many of the most employed seals and materials within the industry.

Looking to the future, Trelleborg is working with its customers on projects incorporating IoT, Artificial Intelligence (AI) and Big Data, with the aim to integrate predictive maintenance into hydraulic systems that will lower downtime and overall total cost of ownership.

Read more about this on page 18.



Blue Dimension™ protects infrastructure and assets

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

www.trelleborg.com