t·time

A MAGAZINE FROM TRELLEBORG GROUP | 3·2019

Solutions that seal, damp and protect critical applications.

PLUS
SENSORS FOR CONSTRUCTION TIRES

HIGH OVER LONDON

THE RIGHT TIRE FOR RICE

Le Grand Paris

The City of Light is doubling the size of the Paris Métro.
It's the largest infrastructure project in Europe.

CONTENT

Cover photo:
Getty Images

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EDITORIAL

MAKE IT EASY FOR CUSTOMERS

New technology enables new ways to generate value for and interact with customers. Trelleborg offers various services supported by digital tools to make life easier and increase value for its customers. This involves smart products with built-in sensors and tracking systems, but also making it easier to do business with Trelleborg via online design programs and digital channels, such as web-based and mobile applications.

Equally important as the technology itself is having employees who understand the business and how the new solutions can best help our customers. In this issue of *T-Time*, get to know one of many employees who work with a cloud-based monitoring system for tires - a solution that is a result of us listening to what our customers need. You will also meet people dedicated to developing high-standard lifesaving hovercrafts for the emergency services.

Peter Nilsson,
President and CEO

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way. The Trelleborg Group has annual sales of about SEK 34 billion (EUR 3.32 billion, USD 3.92 billion) and operations in about 50 countries.

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

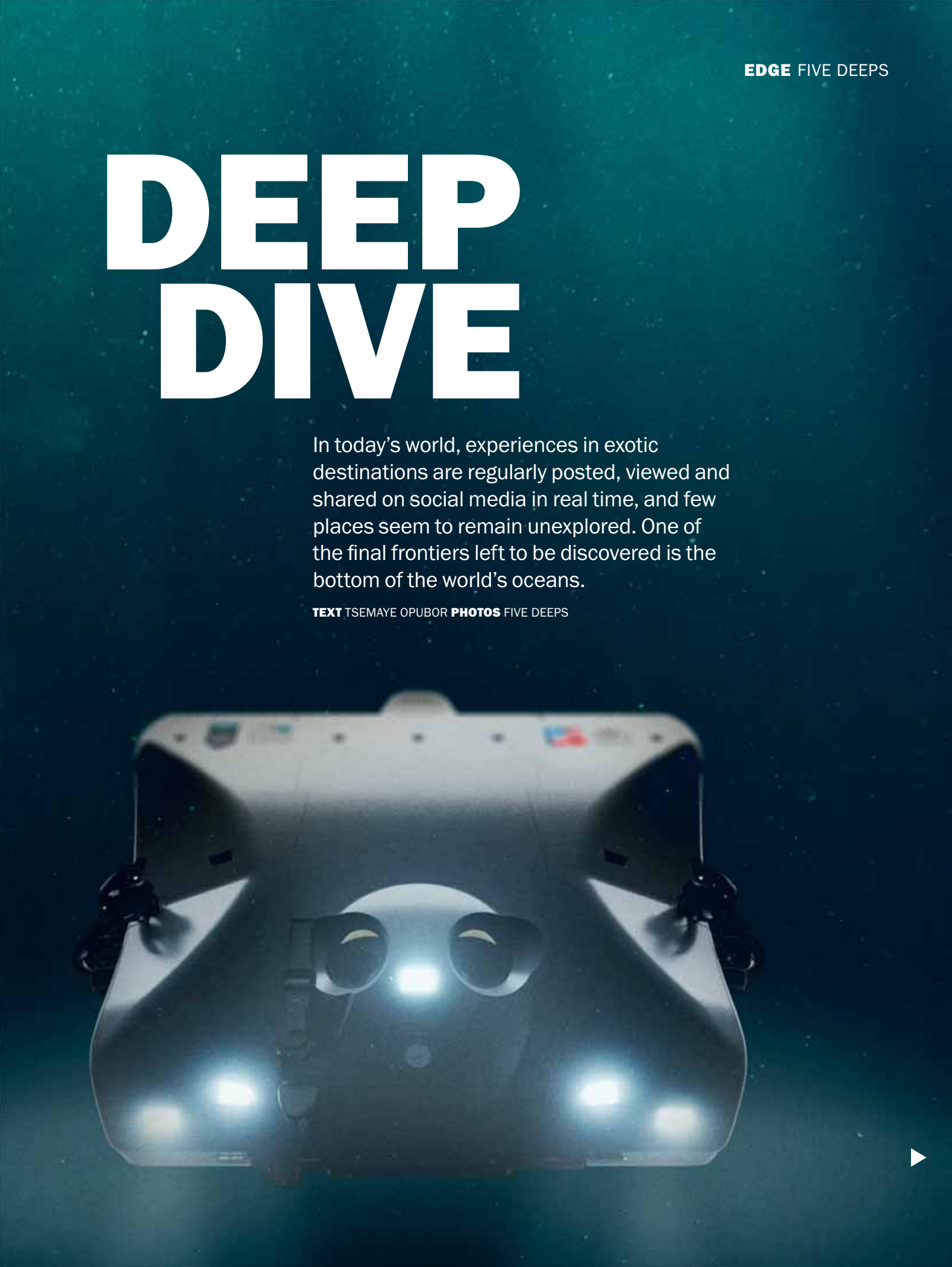
The Trelleborg share has been listed on the Stock Exchange since 1964 and is listed on Nasdaq Stockholm, Large Cap.

TRELLEBORG

DEEP DIVE

In today's world, experiences in exotic destinations are regularly posted, viewed and shared on social media in real time, and few places seem to remain unexplored. One of the final frontiers left to be discovered is the bottom of the world's oceans.

TEXT TSEMAYE OPUBOR **PHOTOS** FIVE DEEPS



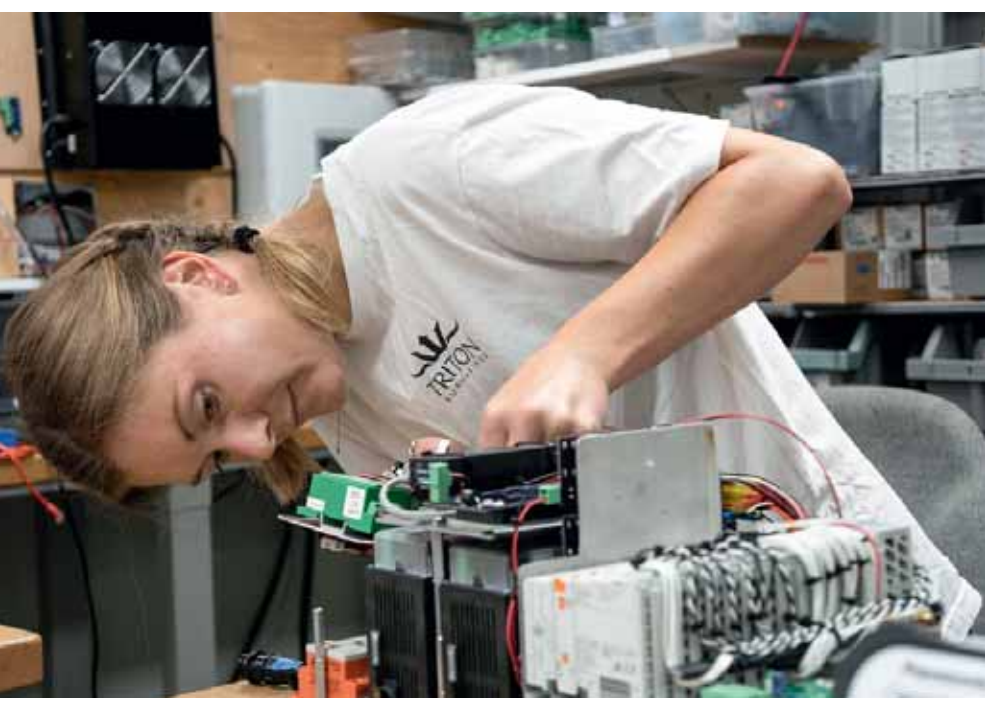
The Five Deeps Expedition, a year-long journey under way since late 2018, launched as the first global ocean journey to send a manned submersible vessel, the *Limiting Factor*, to the deepest point in each of the world's five oceans. It is not only exploring places never visited before, but also being used for technical capability verification and scientific mission.

Since the expedition began, it has managed to capture the global imagination. The significance of what the expedition has already achieved rivals man's first steps on the moon. Every dive conducted during Five Deeps is a first, and the records are stacking up. Besides diving deep into uncharted territory, the expedition has discovered new underwater species.

Victor Vescovo, an American extreme explorer and the initiator and sub pilot of the Five Deeps Expedition project, has had a lifelong passion for exploration. He has reached the highest peak on all seven continents, including Mount Everest, and skied to both the North and South Poles. Upon completion of the Five Deeps Expedition in 2019, Vescovo would be the first person in history to have been to the top of all continents, both poles, and the bottom of all oceans.

Three years of intensive efforts from some of the world's leading oceanographers, submarine engineers and scientists were necessary to make Vescovo's historic attempt of the Five Deeps expedition possible.

Trelleborg Offshore & Construction played an integral role in the development of the



Quality control testing carried out by Triton Submarines.

Victor Vescovo has set a new deep-diving record and is the first human to make multiple dives, solo to the oceans' hadal depths, of more than 20,000 feet (6,000 meters) deep.

The *Limiting Factor* is designed for extensive, repeated dives to full ocean depth.

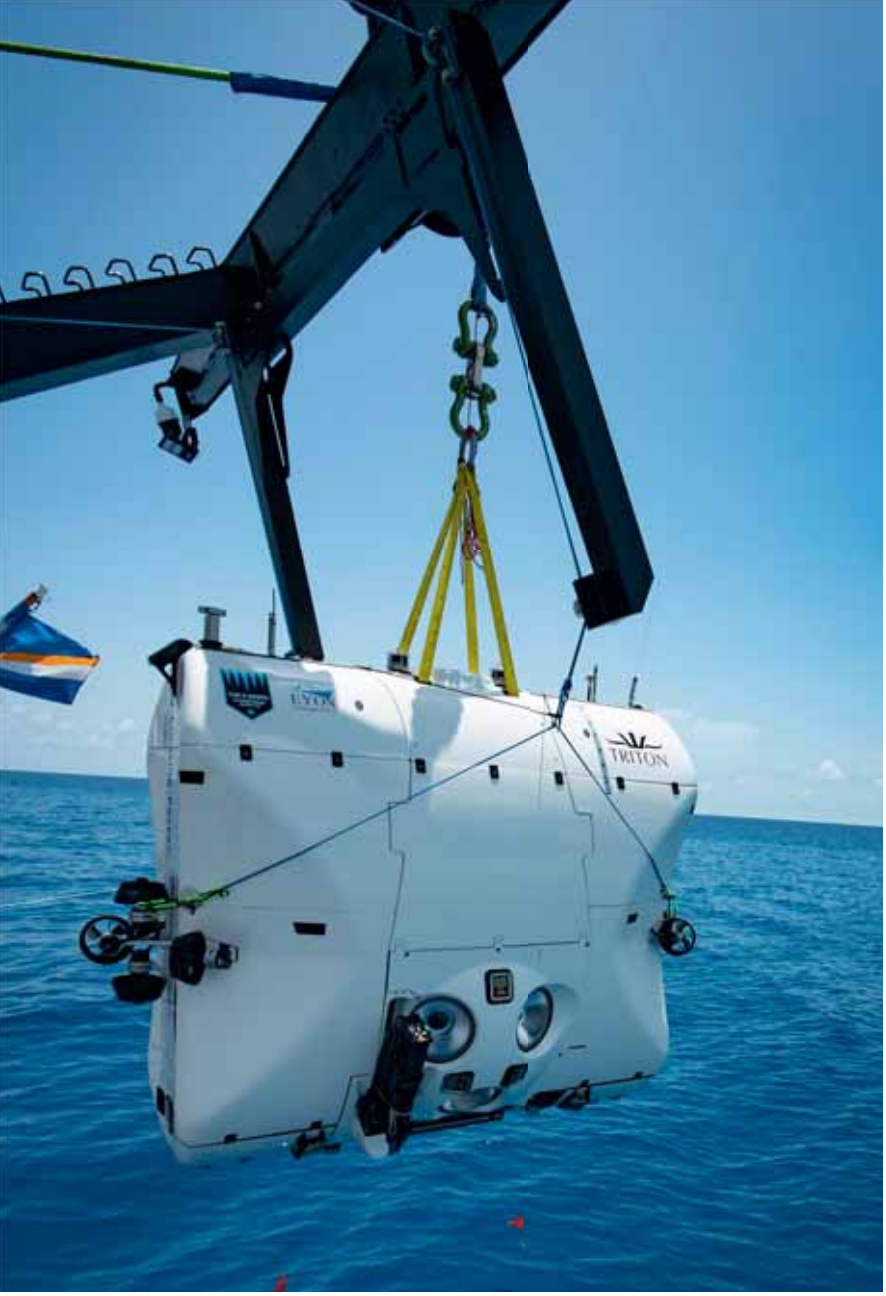
Limiting Factor, providing six buoyancy modules manufactured from Trelleborg's TG-11500 low-density, ultra-high-performance syntactic foam to specifications from the submersible's builder, Triton Submarines LLC. The same syntactic foam was also supplied to Triton for use on "landers" deployed with the submersible. These carried many different types of scientific instruments, as well as guidance and positioning equipment.

"The overriding aim of our project was for the submersible to undertake repeated dives several times, to full ocean depth," says Alan Green, Project Manager, Triton Submarines. "The part that Trelleborg played in that was huge."

Trelleborg collaborated with Triton Submarines in the groundbreaking project initially through a U.K.-based design house, and then subsequently as a technical partner through the offices in the United States.

Testing oxygene system. The *Limiting Factor* is one of the most uniquely capable piloted vehicles in seafaring history.

"Once the buoyancy modules were manufactured by Trelleborg, they were commercially certified by the international maritime authority DNV-GL," says Stephen Sloan, Commercial Manager within Trelleborg Offshore & Construction. The testing for the certification took place at the Krylov State Research Centre in St. Petersburg, Russia. This involved extensive, repeated dives following significant material qualification testing and full-scale cyclic pressure testing of the actual modules to 120 percent of full ocean



depth, which is over 20,000 psi (pound-force per square inch). "Over 1,000 different tests were conducted on the Trelleborg TG-11500 syntactic foam under the scrutiny of DNV-GL over a six-month period," Sloan says.

When the testing was completed, the buoyancy blocks came back from Russia to the U.K. to be finished, and a polyurethane elastomer coating was applied to the blocks. The white Trelleborg buoyancy blocks make up some 70 percent of the overall body of the *Limiting Factor*.

"An expedition of this size and scope has never before been attempted," Sloan says. "The buoyancy has contributed to the success of the mission, and to the record-breaking achievements now being witnessed with each dive."

The Five Deeps is as much about science as it is about extreme exploration. The expedition's scientific program is being led by Dr. Alan Jamieson, a marine biologist at Newcastle University in the U.K. Findings from these extreme depths will be shared with the

ABOUT THE FIVE DEEPS EXPEDITION

The Five Deeps Expedition is the first to attempt to reach the deepest point in each of the Earth's five oceans:

- Molloy Deep
- Java Trench
- South Sandwich Trench
- Puerto Rico Trench
- Mariana Trench/Challenger Deep

The expedition will traverse **40,000** nautical miles or **74,000** kilometers in **11** months.

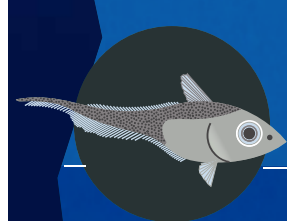
Up to **50** scientific lander deployments will be undertaken alongside the submersible dives.

Discovery Channel will capture the entire mission for a television program that will air in 2019.

Four new species of prawn-like crustaceans were discovered during the Mariana Trench expedition. Headlines were not only filled with stories of the discovery of sea creatures, but also of plastic bags and candy wrappers that were seen on the ocean floor.

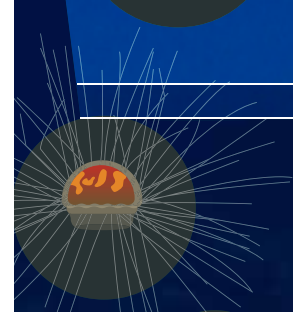
Trelleborg has joined forces with the non-profit organization The Ocean Cleanup and its bid to rid the world's oceans of plastic. Read more on page 23.

Molloy Deep
Arctic Ocean
5,669 meters / 18,599 feet

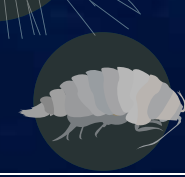


Java Trench
Indian Ocean
7,725 meters / 25,344 feet

South Sandwich Trench
Southern Ocean
8,428 meters / 27,651 feet



Puerto Rico Trench
Atlantic Ocean
8,648 meters / 28,373 feet



Mariana Trench/ Challenger Deep
Pacific Ocean
10,898 metres / 35,755 feet

global academic, oceanographic and environmental communities.

In May 2019, for the fourth time, the Five Deeps Expedition successfully reached the bottom of one of the world's five oceans. The team completed a mission to go to what is commonly known as the deepest point on planet Earth: the Challenger Deep within the Mariana Trench in the Pacific Ocean.

"The Trelleborg team produced a fantastic product, and that has been truly demonstrated by what has been seen over the past few weeks," Green says. "It is a stunning achievement, five dives in the Mariana Trench in 10 days. The design, manufacture and engineering capabilities, and the combined efforts of the Trelleborg team, have produced something truly world class." ■

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"An expedition of this size and scope has never before been attempted. The material itself has contributed to the success of the mission, and to the record-breaking achievements now being witnessed with each dive."

Stephen Sloan, Trelleborg

Hitting the floor in the Mariana trench.

Pressure warning

Tires that monitor pressure and temperature in real time are paving the way for even smarter solutions in the construction business, to enhance safety and improve predictive maintenance.

TEXT SUSANNA LINDGREN **PHOTOS** MAURIZIO CAMAGNA

The construction industry is taking a page from the passenger car business book and capitalizing on the advantages of a cloud-based system that sends alerts when tire pressure is too low.

Tire Pressure Monitoring Systems (TPMS) have been mandatory in new passenger cars in the EU since 2014, and for longer than that in the United States. Now, with the steady advance of the Internet of Things, they are becoming big news in the construction business as well.

"TPMS is a hot topic in construction, mainly because there are huge savings in maintenance," says Luca Giovannini, Senior Marketing Innovation Manager for Trelleborg Wheel Systems. "For passenger cars, the monitoring is largely about safety. For construction vehicles, the ability to optimize performance is the other great advantage."

The new Trelleborg TPMS System was first presented at the construction machinery trade fair Bauma in Munich, Germany, in April 2019. This was followed by a commercial launch in August 2019.

"We may not be the first tire manufacturer to launch TPMS for construction tires," Giovannini says. "But by carefully studying the market we have been able to create a premium solution for our premium tires, that is engineered for better performance. Our offering stands out. And as with most of our innovations, we have had a bottom-up

Luca Giovannini

Title: Senior Marketing Innovation Manager, Trelleborg Wheel Systems
Family: Married with two young daughters, ages 1 and 3
Lives: In Rome, Italy
Education: Master of Science in Business Administration, Rome, and ESSEC Business School, Paris
Work: Since 2007 at Trelleborg, previously at Procter & Gamble
Interests: I am an old-school collector of film and music and have thousands of CDs, DVDs and Blu-ray discs. Besides that I love traveling – I visited all continents before the age of 25. I also like mountaineering and playing tennis
What drives you: To discover new solutions in business

Sensors monitor the tire and optimize performance. Trelleborg's Luca Giovannini is part of the team behind the innovation.

approach, where we started by listening to our customers."

To develop a prime solution, Trelleborg teamed up with the German company Alligator, one of the world's leading suppliers of TPMS equipment. The result of the collaboration is a cloud-based TPMS system that integrates the tire sensors, a central gateway on the construction machine and an online platform. This makes it possible to fully monitor fleet operations at any time and from anywhere. Maintenance checks can be done without any interruptions, which saves downtime as well as labor costs. Besides providing instant access to vehicle status information and GPS location, the system sends automatic alerts when needed.

Compared with other solutions on the market, the new Trelleborg TPMS sensor has an extra-long battery life. It's guaranteed to last for at least five years, far exceeding the average lifespan of most construction tires. The sensor is easy to mount, as well as to move from one tire to another. As long as the sensor is active, the data collection is uninterrupted and the history of temperature and pressure data will remain intact.

"What we have launched so far is only step one for making the operator's life easier in demanding construction environments," Giovannini says. "Our future roadmap will add more features that will help optimize performance in different ways. In the reasonably near future, the data collected by TPMS systems should, for instance, be able to predict and guarantee the perfect route and speed of operations for extended tire life."

All connected tires rolling on construction sites across the globe will contribute to the TPMS development process by collecting data.

"Analysis of the big data gathered will most likely allow more dynamic operations, extending tire life and reducing the number of products

Increase your fleet uptime

The new Trelleborg TPMS System is an advanced, sensor-based check-up system, which monitors real-time tire pressure and temperature. Engineered especially for construction applications, the cloud-based system integrates tire sensors, a central gateway on the construction machine and an online platform to fully monitor fleet operations and avoid accidents.

Giovannini and Giorgio Saccoccia, Calender Line operator, in the Tivoli tire production facility near Rome, Italy.

carried in stock for safety, both of which are great money savers," he says. "And if our customers approve, we will also use the data to improve the performance of our tires, to make them even more efficient, and to see how we can be more effective in our service actions."

As Trelleborg can offer premium tire pressure monitoring systems for farm vehicles as well as for the construction and other industries, Giovannini and his team are already preparing for the next launch – a tailor-made, risk-eliminating TPMS solution for vehicles working at ports and airports.

"In construction, each machine generally has a specific purpose, which limits some of the risks if correctly monitored," he says. "In port operations the speed is higher. Heavy loads require higher tire pressure, which increases the risks of accidents, especially in container handling operations."

The biggest scope for increased safety, though, would be to present a sensor that could measure the wear on the tire and signal when it's time for replacement. "That would be the ultimate innovation for tire manufacturers as well as drivers of all kinds of vehicles," Giovannini says. "I am sure that someone soon will discover the magic formula, and I would not be surprised if that technology is in place within the next five years." ■

Giovannini and his team are preparing for the next launch: a sensor system for vehicles working at ports and airports.

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"By carefully studying the market we have been able to create a premium solution for our premium tires."

Luca Giovannini, Trelleborg

SAFE IN THE AIR

In this age of globalization, demand for air travel continues to rise. Trelleborg is constantly working on solutions that help to make air travel safer and more efficient.

TEXT ANDREW MONTGOMERY **ILLUSTRATION** NILS-PETTER EKWALL

Air travel is projected to grow by 6 percent in 2019 and over the next 15 years to have an annual growth rate of 4.7 percent. As direct emissions from aviation account for about 2 percent of global emissions, travel by air is a hot topic in the climate change debate. In light of this, the aerospace industry is investing in innovation that will lower emissions in lighter airplanes that consume less fuel, biofuels, electric airplanes and smarter flying, for example.

As virtually every aircraft platform contains Trelleborg components somewhere, if you are traveling on a plane for business or pleasure sometime soon, the company's products will be there to seal, damp and protect. And its solutions are not just in the air but on the ground too, on baggage carts and air bridges. ■

Engines
1. Seals operate at extreme temperatures, be it engine heat or the frigid air at high altitude. Annulus filler seals for the main fan improve aerodynamics and fuel consumption. Fire seals in the ducting system improve safety, and bleed air valve seals at the engine-nacelle interface detect fire and deflection.

Airframes
2. Airframe seals are used within the engine compartment but also throughout the aircraft body, on wings and moving surfaces such as doors and hatches, where they boost aero-dynamic efficiency.

Flight controls
3. Flight controls are the most demanding of all aircraft hydraulic actuation systems and require dynamic sealing systems.

Ground support equipment
4. Safety standards mean aircraft refueling hoses are lightweight, vacuum and abrasion resistant, with a fire-resistant cover.

Landing gear
5. Dual contact seals help extend the operating and service life of landing gear on nearly all aircraft.

Entering and exiting the plane
6. Efficiency and safety are key when deploying air bridges and steps. Specially-developed tires help people embark and disembark planes as quickly as possible with the utmost stability.

7. Sophisticated coated material is used for aircraft evacuation slides. They meet the latest safety standards and enable the evacuation of 60 to 70 passengers per minute per lane; that's three evacuees at a time down a slide.

AEROSPACE

Products for the aerospace industry account for 6 percent of Trelleborg's net sales.

1949
The world's first commercial jet airliner was the British de Havilland Comet, which first flew on July 27, 1949, and entered service in 1952. British Overseas Airways Corporation and Dan-Air were among the now-vanished airlines that used the plane.

Flight 1549
On January 15, 2009, US Airways flight 1549 struck a flock of Canada geese and lost all power in its engines as it climbed away from New York's LaGuardia Airport. Unable to reach a runway, pilots Chesley Burnett (Sully) Sullenberger and co-pilot Jeffrey Skiles glided the Airbus 320 onto the nearby Hudson River. Escape evacuation slides were deployed, that featured coated fabric made by Trelleborg, and all 155 passengers and crew were saved.

4 out of 5 people
80% of the world's population or four out of five people, have never flown on a plane. But roughly 4 billion passengers will travel on commercial aircraft this year.

SR-71
The US Air Force's Lockheed SR-71 "Blackbird" holds the world record for both speed and height for an air-breathing aircraft. In 1976, the Blackbird flew an incredible 85,135 feet above the ground. An SR-71 set a speed record of 2,193 mph (3,529 kph).

19

19 hours
The world's longest commercial flight is much disputed by several global airlines, but the title currently belongs to Singapore Airlines, which launched its 19-hour nonstop service from Newark Airport in New Jersey, USA, to Singapore in October 2018.

"I knew one thing: I wanted to see the world."

In 1964, the American pilot Geraldine "Jerrie" Mock became the first woman to fly solo around the world. Mock flew a 1953 Cessna 180 single-engine monoplane, the Spirit of Columbus, beginning her journey on March 19 from Columbus, Ohio, flying eastward, and arriving back home after 29 days, 11 hours and 59 minutes and 37,180 km (23,103 miles).

30,187

flights a year

The world's busiest flight route is between Malaysia's Kuala Lumpur International Airport (KUL) and Changi Airport, Singapore (SIN), with 30,187 flights in the course of a year. By comparison, New York JFK to London Heathrow has 14,195 flights in operation.

Sources: OAG, CNBC

Skirting the issue

Neoteric Hovercraft's vessels are used by rescue services worldwide. When the company needed a more durable solution for its hover skirts, it turned to Trelleborg for hard-wearing coated fabrics.

TEXT ANDREW MONTGOMERY
PHOTOS MATS RYDE (SJÖRÄDDNINGSSÄLLSKAPET)

Now perhaps the world's leading manufacturer of light hovercraft, Neoteric Hovercraft had humble beginnings. Founded by a group of teenage Australian Air Training Corp cadets in 1960, the company is still led today by one of those cadets, Chris Fitzgerald, now located in the U.S. state of Indiana.

Neoteric Hovercraft has customers in more than 50 countries, serving those in industries that include emergency services and leisure.

Fitzgerald, now 74 years of age, is a true hovercraft pioneer. He has devoted nearly 60 years of his life to the thriving business.

Neoteric's success rests partly on its reverse thrust control system, which at 60 percent reverse thrust is proportionally far more powerful than the 18 percent of jet aircraft. This makes it the only hovercraft in the world that has effective brakes!

Search and rescue teams in particular appreciate the hovercraft's stability on terrain from frozen lakes to swampy marshes. It means that rescuers can stand at the edge of the craft to pull someone on board without the risk of it capsizing.

"I'm happy to say our hovercrafts have helped save a lot of lives over the years, including in ice accidents in the Nordic Region," says Fitzgerald. He once met a Finnish man who fell through the ice into a lake and was rescued by one of Neoteric's hovercraft.

But uses for the hovercrafts go beyond rescues. Mining companies utilize them to apply dust control sealants inside mines, and they have been employed by agencies working to clean up oil spills. Then there are those who just love the thrill of racing them—especially in Europe.

"A hovercraft is essentially a boat that's sitting on a bubble of air. You need a material for the skirt that's got to hold in the air but is not too heavy for the engine."

Chris Fitzgerald, founder of Neoteric

Rescue hovercrafts help save lives.

Fitzgerald is a true hovercraft pioneer. "It's been my whole life," he says.

Believe in new ideas

Chris Fitzgerald is from Melbourne, Australia. He is a trained technician at aeronautical research authorities and was drawn to hovercraft after seeing SON1's English Channel crossing on Australian TV in 1959.

Things took off when he received a Rotary Foundation grant in 1969, which funded trips around the world to various hovercraft companies, including a four-month internship at British Hovercraft and a fateful meeting with a manufacturer in Terre Haute, Indiana, in the U.S.

Fitzgerald moved to the U.S. in late 1975 because the market was stronger, and he set up shop in Terre Haute. He began with kits before developing built-to-order models.

"I set up the Hovercraft Club of America in 1976 and also helped start the World Hovercraft Federation in the early 1980s. They're still going strong," says Fitzgerald.

As for the name? Fitzgerald says that Neoteric means "newfangled" or modern.

And as a noun it means "a person who advocates new ideas." Highly appropriate!

Despite successful applications, Fitzgerald found that the hover skirts were wearing out too quickly under the stresses of everyday use on surfaces such as ice, sand and concrete.

"We'd been using 16-ounce (0.5-kg) neoprene-coated nylon for years, but this is too expensive and heavy. We've also used packcloth, but for proper durability neoprene-type material is required.

"You have to remember that a hovercraft is essentially a boat that's sitting on a bubble of air. You need a material for the skirt that's got to hold in the air but is not too heavy for the engine. You want to be touching the surface but let the air 'lubricate' the hovercraft's movement."

Having previously sourced materials from Reeves Brothers, Fitzgerald started researching coated fabrics. This led him to approach Trelleborg, which had acquired Reeves Brothers in 2006.

David Behrens, Regional Sales Manager, Trelleborg Coated Systems.

"The challenge was to find an abrasion-resistant material that could wear like iron yet would still be lightweight and air-retentive enough, so that the hovercraft could still operate effectively," says David Behrens, Regional Sales Manager within Trelleborg Coated Systems.

"Our research and development department produced some samples for Neoteric, and these were tested thoroughly."

Neoteric's testing machine is called the Flagellation Rig. It runs the material in a chamber at enormous speed and friction, like a hurricane hitting a flag, until the material comes apart. Trelleborg's neoprene-coated fabric performed exceptionally well.

"The fabric is working really well and I'm happy with it," says Fitzgerald, "although there's huge scope for improving these fabrics further, given a bigger market.

"Ultimately I'd like to find a company that would be interested in taking over. But I've been in that mindset since I moved Neoteric Hovercraft to the United States back in 1975. It's been my whole life." ■

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Sealed to slide

Wardian London, an innovative residential complex in London's Canary Wharf business district in England, combines modern architecture with organic nature. Trelleborg collaborated with aluminum manufacturer Wicona to develop an efficient expansion sealing concept for sliding doors that protect residents from the elements.

TEXT TSEMAYE OPUBOR **PHOTO** ECOWORLD BALLYMORE

The Wardian complex consists of two skyscrapers. At 50 and 55 stories high, they offer space for 792 apartments, each with access to its own wrap-around private garden.

Project developers EcoWorld Ballymore contracted Sipral, a facade specialist company, to deliver customized balcony structures with glass railings, as well as facade systems, including sliding doors, glass corners and windows.

Wicona, a subsidiary of the Hydro Group, was the system supplier for the element facade and developed a solution for the production of custom-made pull-slide doors for the balcony structures. These innovative, low-operating-force aluminum doors balance maximum natural light with exceptional weather performance for user comfort. They allow residents an unhindered view of London, as well as access to their private green terraces.

The element facade is equipped with expansion seals from Trelleborg. The profiles balance action and tolerances resulting from structural load or heat and cold expansion. They also prevent tension in facade elements, which could result in damage and leakage. The Trelleborg expansion seals were installed according to the solid

Trelleborg has developed an expansion sealing concept for sliding doors in the luxury residential project.

Wardian Tower is a visionary residential complex in London's Canary Wharf business district.

bearing/floating bearing principle, where one side sits firmly in the facade element, while the other side can slide.

Bernhard Haass, Manager Design and Industrial Engineering for sealing profiles in Western and Eastern Europe within Trelleborg Industrial Solutions, explains: "As a result of many years of collaboration and close exchange of experiences from many projects, we can specify profile geometries at the quotation stage, which often do not need further modification." ■

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Wardian London

Located: Canary Wharf, Isle of Dogs, London, England
Design: Glenn Howells Architects
Project developer: EcoWorld Ballymore
Landscape architect: Huw Morgan, Camlins
Height: West Tower 168 meters (551 feet), East Tower 185 meters (614 feet)
Apartments: 792 (studio, one- or two-bedroom apartments)
Sealing profiles delivered: Around 45,000 meters (148,000 feet) of two types of sealing profiles

Rice farming occupies a special niche in American agriculture. A big key to success is having the right tires on farm equipment.

TEXT MICHAEL MILLER
PHOTOS JOHN DAVID PITTMAN

A TIRE FOR ALL SEASONS

In the southern U.S. state of Arkansas, David Petter grows rice along with his brother Robert on a farm that includes acreage that has been in his family for more than 100 years.

"Rice is a forgiving crop," Petter says. "It's great to watch it grow once you put fertilizer on it and give it some water. You can almost see it growing in front of your eyes."

Although rice is one of the most widely grown grains in the world, it is not one of the major crops produced in the United States, and growing it takes special skills and equipment. Unlike wheat, corn and soybean acreage, rice fields remain flooded under two to four inches of water through most of their growing season. For a producer like Petter, who also grows soybeans, finding the right tires for his farm equipment can be a challenge.

Rice farmers in the United States typically use what are called rice and cane tires (cane refers to sugarcane, which is grown in much the same areas and soil conditions as rice). But Petter says in his experience, rice and cane tires tend to wear poorly and make for a rough ride. Enter Trelleborg, which worked with Petter and his tire dealer, Bobby Henard Tire Service in Brinkley, Arkansas, to develop a new hybrid tire that could work in all kinds of conditions the year round. The tire, called TM600, got its first test in August 2018, harvest time for the rice. A recent rainstorm had made the ground extremely muddy when Petter drove his tractor with the new Trelleborg tires into the field.

"Within 30 minutes I was sold on them," he says. "The tires did more than I could imagine, hauling out 800 bushels [22 metric tons] of harvested rice in a grain cart."

Besides serving as a workhorse in the field, the new tires made for a comfortable ride. "It just pretty much fitted our bill," Petter says. "Rice and cane tires don't wear very well on concrete or asphalt highways and don't ride well in the field. The hybrid tires ride smoothly. You can pull off into a muddy field knowing that they're going to handle the mud with the implements you're carrying, or you can go into a dry field knowing that the tires are going to do just what they need to do."

The TM600 tires are designed to cast off the mud that tends to stick to conventional tires. Petter frequently surveys his fields by the use of drones, and footage from the flights shows how effectively the tires shed mud, thanks to the pitch of the treads.

Trelleborg's hybrid tires wear extremely well, Petter found. "We have probably spent 500 hours on a set and you can still see the lettering on the tires," he says. "The majority of our equipment at the

The Petter brothers are third-generation farmers. They use the latest technology on their farm in Arkansas, U.S.

David Petter

Lives: Near Stuttgart, Arkansas
Farms: Rice and soybeans with his brother Robert
Family: His wife, Monica Petter, is a poet and novelist who has published nine books
Professional activities: Active in the Arkansas Rice Federation and USA Rice Federation
Education: He has a degree in administrative management from the University of Arkansas at Fayetteville
Special interests: Steel fabrication
Leisure pastimes: Golf, hunting, fishing, skeet shooting

"I was quite frank with them, telling them what I liked. I haven't really found anything that I dislike about them yet."

David Petter

farm now has Trelleborg tires on it. They're now on seven or eight pieces of equipment, and I'm planning on putting them on another tractor this summer. They work in all kinds of wet and dry field conditions."

Petter says, Trelleborg initially approached him through a reference from Greenway Equipment, a John Deere tractor dealer in Stuttgart, Arkansas. "What Trelleborg needed was someone who could be honest and tell them the truth about their product," he says. "I was quite frank with them, telling them what I liked. I haven't really found anything that I dislike about Trelleborg's tires yet."

Trelleborg invited him to visit its facility in Spartanburg, South Carolina, to see how the tires are made. It was his first-ever visit to a tire manufacturing facility and he was impressed to see the type of tire he uses on his sprayer as it came off the assembly line, still warm from the forming press. "It was a great trip for seeing just what they go through in developing and manufacturing a tire," he says.

Convinced that Trelleborg was on to something, Petter told his financial adviser to buy him some shares in Trelleborg. If Trelleborg is as successful as he expects it to be, he looks forward to receiving some nice dividend checks. "And if not," he says, "I'll still have a good set of tires." ■

The hybrid tire from Trelleborg eliminates the need to use two different types of tires.

Rice is one of the most widely grown grains in the world.

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About Trelleborg's TM600 hybrid tire

Farmers in the American South typically have to use two different types of tires on their equipment, depending on the time of year. Trelleborg worked with rice farmer David Petter to develop a hybrid tire that can stay on the tractor year-round.

The tire that Trelleborg developed is the TM600. It covers the gap between the tread types R1-W (a wet traction tread for sticky soil conditions) and R2 (rice and cane tires). It is the ideal solution for producers looking for versatility in their operations who need a tire for heavy, wet field operations and light road use.

NEWS

System 001 deployed in the Great Pacific Garbage Patch

Fenders help clean the oceans

Trelleborg's marine and infrastructure operation has joined forces with The Ocean Cleanup and its bid to rid the world's oceans of plastic. Trelleborg supply The Ocean Cleanup system with floating pneumatic fenders that are used as giant floating buoys, which are connected to create a wind area. This functions as a sail, pulling The Ocean Cleanup's advanced passive drifting boom system forward.

The Ocean Cleanup's System consists of a 600-meter-long floater that sits at the surface of the water and a tapered three-meter-deep skirt attached below. The floater provides buoyancy to the system and prevents plastic from flowing over it, while the skirt stops debris from escaping underneath. As the system moves through the water, the plastic collects within the boundaries of the U-shaped system. The concentrated plastic will be brought to shore for recycling.

For more information on The Ocean Cleanup, visit: theoceancleanup.com

Message in a bottle

To create a better future, Trelleborg has decided to try to stop sending single-use plastic bottles to waste. Starting with the initiative from one of its employees, Philipp Gerstenberg, Trelleborg aims to be 100 percent free from single-use plastic bottles by 2020.

26%

The share of women in Trelleborg at management levels four and five is 26 percent and continues to increase, creating a recruitment base for higher levels.

New seals for electric cars

Trelleborg Sealing Solutions has launched the HiSpin® PDR RT and HiSpin® HS40, two seals specifically developed for e-Mobility applications. Engineered to operate at high velocity, they make a significant step in overcoming issues related to sealing at high rotary speeds that limit the ability of electric cars to meet the ultimate goal of traveling the same distance as a gasoline vehicle on one charge.

"The new HiSpin® PDR RT and HiSpin® HS40 will contribute to extending the traveling distance of electric cars, helping make the mass adoption of these vehicles a reality rather than a dream", says Jan Zumbach, Head of Business Development for e-Mobility at Trelleborg Sealing Solutions.

The great transformation

From the Palais du Louvre to the Eiffel Tower, Paris has never feared an engineering challenge. Now the city has embarked on its biggest building project in a century: Le Grand Paris.

TEXT ANDREW MONTGOMERY **PHOTO** UNSPLASH

Paris has so many world-famous historical monuments that it's often described as a living museum. But the city's long history also includes massive urban renewal projects, such as Baron Haussmann's creation of its famous boulevards and parks in the mid-19th century, or the development of La Défense business quarter from the late 1950s to the present day.

The latest of these "grand projets" is *Le Grand Paris*. Driven by the French government, it's an urban, social and economic development program that aims to transform Paris and the surrounding Ile de France region into a major world metropolis of the 21st century. It seeks to do so by making improvements to living environments, reducing economic and social imbalances, and building a sustainable city.

The main driver of the *Le Grand Paris* is known as *Le Grand Paris Express*, a huge expansion of the greater Paris public transport network. It's now the largest infrastructure project in Europe.

By 2030, *Le Grand Paris Express* will nearly double the size of the Paris Métro, adding 200 kilometers to the current 220-kilometer underground rail network, making it the third largest in the world behind those of Shanghai and Beijing in China.

The map shows the new underground rail network (lines 15, 16, 17 and 18) on top of the exisiting Métro.

Work on this future super-metro started in 2015 and involves the creation of four new lines (15, 16, 17 and 18), the extension of two existing lines (11 and 14) and the construction of 68 new stations, seven technical centers and 250,000 new homes – all for a total price tag of between 35 and 40 billion euros.

Dozens of companies are now hard at work on this colossal project, including Trelleborg.

"Trelleborg is a key player in the Grand Paris project," says Antonio Ferreira Agostinho from Inter Service Pompe, a key provider of concrete pumps on job sites. Ferreira Agostinho's company has been pleased with the capacity of Trelleborg Industrial Solutions to supply all the concrete pump hoses used for pouring foundations.

200
more kilometers

4
additional lines

68
new stations

90%
underground

And Trelleborg is also contributing further down the pyramid of this pharaonic enterprise – 50 meters below street level, to be exact.

There, Trelleborg is supplying the special hoses that are being used by 21 tunnel boring machines to cut and remove tons of excavated material for the four new underground metro line tunnels. No less than 42 million tons of excavated material will be evacuated during the process and treated by slurry treatment stations.

"We're excited to be part of this," says Hakan Yorulmaz, Business Developer within Trelleborg Industrial Solutions. "Nobody has ever dug anything this big before so quickly. It's a truly historic undertaking."

The depth of the project calls for a huge range of technologies. Auger bores, wall cutters, horizontal or vertical tunneling, slurry treatment machines - all are being deployed, and the unprecedented scale has required redesigning existing solutions. Trelleborg has created a dedicated team, including marketing, sales and engineering support from manufacturing sites.

Trelleborg has also been adapting its existing solutions. At its facility in Clermont-Ferrand, France, it designed a special high-velocity supply chain that can deliver almost any order to a Grand Paris contractor within 48 hours.

In addition, Trelleborg engineers have also modified its hoses and equipment to meet contractors' needs. The team is now working

The depth of the project calls for a broad range of technologies.

Trelleborg is a key player in the Grand Paris project.

"Next, we're going to add some intelligence into newly designed hoses."

Hakan Yorulmaz, Business Developer at Trelleborg

closely with Soilmec, a drilling and foundation equipment manufacturer, to modify its DN 150 hose-placed wall cutters, improving the lifespan of the hose used for the evacuation of the sludge.

"We're glad to have Trelleborg working with us on this important project," says Paolo Tiezzi of Soilmec. "It's been exciting to collaborate with them."

One of the key modifications has been to strengthen the wall-cutter hose to withstand tensile forces of up to 10 tons, with particular attention to its wear resistance, crush resistance and axial load resistance, as well as the convenience of its advanced reduced bending radius. Some of those capacities depend on the special construction of the hose: the couplings are vulcanized and not crimped.

"A first prototype order should allow us to test our hose at the Saint-Denis site in Paris to validate its technical characteristics," says David Mayau, Technical Director within Trelleborg Industrial Solutions.

And, fittingly for this ambitious engineering project, the technological advances don't stop there.

"Next, we're going to add some intelligence into newly designed hoses," notes Yorulmaz. "The great transformation of Paris is truly under way. ■

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Super metro

Le Grand Paris Express is the largest transport project in Europe. It consists of a ring route around Paris and lines connecting neighborhoods.

- 4 additional lines
- 68 new stations
- 200 km of new railway lines
- A train every 2 to 3 minutes
- 2 million commuters a day
- 90% underground
- Started 2016, finish 2030

Fun fact: Innovations will be quicker as a scientist will be able to go from Orly airport to the Paris-Saclay university campus in just 15 minutes, instead of the 1 hour and 6 minutes it currently takes.

NEWS

On the right track

With the development of a state-of-the-art manufacturing facility for anti-vibration solutions in Bengaluru, Trelleborg significantly increases its production capabilities in India. Opened in April 2019, the new 6,200-square-meter site will also facilitate the local manufacture of Trelleborg's portfolio for the rail industry.

Rail is an important mode of transportation in India. The country's rail network is the world's third largest, and the Indian government has committed to large investments to modernize the network.

Ranadip Basu, General Manager of the new facility at Trelleborg Industrial Solutions, says, "The opening of our site in Bengaluru represents a significant investment for Trelleborg and demonstrates our commitment to local manufacturing, enabling us to better serve our customers with local expertise."

Increased diversity

Trelleborg is taking steps to become an even more diverse company. By the end of 2018, management at levels one to three of the company (the senior management team and those in senior positions in the business areas) comprised 15 different nationalities, compared with 13 in 2017.

22%

Share of the Trelleborg Group's total net sales deriving from North America.

"We put a huge amount of effort into gathering information about new technologies and what printers need."

Marco Carlini, Regional Sales Director APAC (Asia-Pacific) for printing solutions within Trelleborg Coated Systems, on how Trelleborg is pioneering the development of offset blankets for the printing industry.

Lower emissions

Emissions to air of volatile organic compounds were drastically reduced during 2018, in part through increased recycling.

World's largest O-Ring

The Trelleborg Sealing Solutions facility in Tewkesbury, England, set a challenge to the local school to plan to make the largest O-Ring in the world from Trelleborg's unique Fleximold process. The project ran over a couple of months until July 12 when the world record attempt was achieved. The O-Ring was 364 meters and big enough to go around Tewkesbury Abbey, involving the local council and community. The O-Ring was physically laid around the historic abbey!

Circular tire production

Innovations and new ways of working in Trelleborg's tire facility in Sri Lanka are contributing to Trelleborg meeting three of the UN's Sustainable Development Goals.

TEXT ANDREW MONTGOMERY **PHOTO** GETTY IMAGES

Sustainability is an overarching goal in tire production at Trelleborg Wheel Systems. Or rather, several goals. Gianluca Abbati, R&D Director for material handling and construction tires, as well as global compounding within the busienss area, explains how meeting the United Nations' Sustainable Development Goals (SDGs) is central to Trelleborg's R&D and production processes for industrial and construction tires.

"Our approach starts with the UN SDGs, and how Trelleborg can contribute to them. It's not just about sustainability concerns in terms of environmental impact but also about protecting what really matters. This has prompted our use of alternative, sometimes unconventional, materials for tire manufacturing. We focus on using these different products with a clear goal: to produce tires that last longer for the customer, and thus reduce the usage of raw materials in the long term."

There are three Sustainable Development Goals out of the 17 indictated by the UN that are particularly relevant to Trelleborg's tire production - number seven (Affordable and clean energy), number nine (Industry, innovation and infrastructure) and number 14 (Life below water). Abbati says Trelleborg's facility in Sri Lanka is playing a crucial role in the company's contributions to all three of these goals.

"Sri Lanka is a global incubator for ideas about new, cleaner materials. We have a good cooperation with local universities and have developed really strong skills in rubber compound formulation. We intend to reinforce this expertise by globally co-operating with the other R&D centers in our business area."

Goal number seven, affordable and clean energy, is reflected in Trelleborg's investment in an advanced biomass boiler for the Trelleborg Sri Lanka facility's steam production process.

Steam production is essential to the tire curing process, but traditional furnace oil boilers produce huge CO_2 emissions. The biomass boiler, like the one in Trelleborg's facility in Brazil, will slash emissions, with 11,000 tons of CO_2 equivalents being cut to less than 1,000 tons; a 90 percent reduction each year.

And the supply of biomass for production will be entirely fulfilled by local producers, so shortening the supply chain, reducing emissions and supporting the local economy.

Trelleborg in Sri Lanka also contributes to SDG nine, centering on innovation.

One example is the Pit Stop Line that Trelleborg has developed to indicate when a tire on a forklift must be replaced. An orange compound appears on the surface of the tire when the tire has about 80 to 100 hours of service life left. Unlike other tires, forklift tires do not need a tread to be effective and this means it is hard to tell when the tires need replacing. The Pit Stop Line prevents premature scrappage of tires, contributing to fewer tires being used.

Another initiative is on new chemical formulations of compounds to make tires last longer and reduce raw material usage. There is also a steady increase in the use of biodegradable, biocompatible and renewable materials, such as coconut shell powder and pyrolysis carbon black, and a focus on tire recycling.

For instance, Trelleborg in Sri Lanka recently ordered reactive filler or recovered carbon black, for tire production.

"The deal is representative of Sri Lanka's role as a global test lab," says Abbati. "Our chemists worked with the supplier to find the right recipes and after four years of development, we were ready to order.

"By using this reactive filler, we reduce the energy spent to produce the carbon black by traditional methods and the scrap tires. This is another good example of SDG number nine."

Trelleborg's contributions to SDGs seven and nine, in turn help address SDG number 14, 'Life below water.'

Gianluca Abbati, Trelleborg

17 goals

The 2030 Agenda for Sustainable Development involves 17 Sustainable Development Goals (SDGs) that address the global challenges we face, including those related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. It was adopted by all United Nations member states in 2015.

Tire waste is a global environmental concern. Microplastic particles left on asphalt can be blown by the wind into rivers and oceans. Abbati says an average 12.2 million tons a year of general plastics go into the ocean, with 0.9 million tons a year being microplastic. Of that, 270,000 tons a year is fine tread powder.

"That's why we use biodegradable and biocompatible materials," he says. "We are working to adapt our formulation for tires to the kind of material that will slowly reduce the usage of the traditional materials, and we are getting there step-by-step. We want to extend this work to all of our product portfolio."

Trelleborg produces tires that last longer and thus reduce the usage of raw materials in the long term.

And his commitment is clear. "Historically, chemists have always been seen as contributing to the generation of pollution. As a chemist, I feel I have a moral obligation to prevent this from happening. Going further, this is our mission. It's part of our social responsibility to work out how we can contribute in a small way to bettering the health of our planet.

"The companies of the future will need to challenge themselves to use different, more sustainable materials; it will require new skills going forward." ■

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Recovering value

In June 2019, Trelleborg's facility in Sri Lanka placed three orders with Swedish company Enviro for recovered carbon black (EnviroCB) for the production of its solid tires.

Carbon black is used as a reinforcing filler in tire production and helps conduct heat away from the tire tread and belt. The orders marked the commercial stage of a four-year process involving Enviro and Trelleborg's chemists working on developing an effective way of recycling a material that has significant environmental impact.

"Since 70 percent of all carbon black that's consumed is in the tire industry, Enviro's long-term target has been to enter into this segment, and we are very happy that the cooperation with Trelleborg in Sri Lanka is up and running," says Enviro's CEO Thomas Sörensson.

Enviro's mission is to recover value from materials that would otherwise go to waste, but Sörensson also points to a commercial advantage in the development of recovered carbon black.

"Environmental benefits are central in what we're doing but with the constraints there are on different types of material, the industry is not only looking at it from the sustainability angle to recover and reintroduce materials. They need to expand their role in the value chain to secure their supply of material in the long run."

Paolo Pompei, President at Trelleborg Wheel Systems, says, "The transition to recovered carbon black is completely in line with our goal of managing our environmental impact throughout the entire life cycle of the tire and reducing CO_2 emissions from both production processes and products."

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