

t·time

A MAGAZINE FROM TRELLEBORG GROUP

2·2023

Solutions that seal, damp and protect critical applications.

PLUS
EXTRAORDINARY
INFRASTRUCTURE

SEALING THE DEAL
ON PARTNERSHIP

ESSENTIAL DESIGNS
FOR SAFETY AT SEA



The sound of silence

How flexible office spaces
can keep the peace

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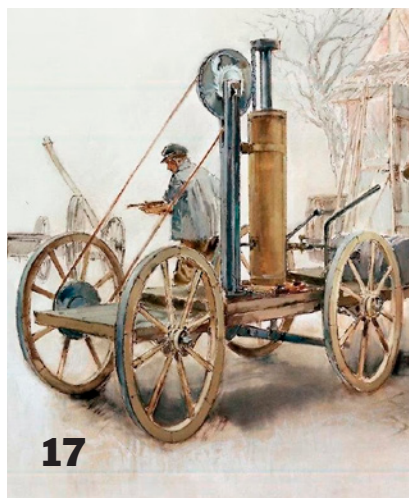
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Why good old hydrogen may be the future of green transport.



EDITORIAL

EVERYTHING COUNTS

I have very varied tasks and am rarely in the same place for several days in a row. I can appreciate the quiet of my office as well as the murmur of a meeting room. In this issue of *T-Time*, you can read about a customer of ours whose products enable customized aesthetic and functional workplaces, using Trelleborg's sealing profiles.

Everything counts in the development of new fuels. At Trelleborg, we are proud of our expertise in engineered seals for all types of transport and fuels. In parallel with battery technology for vehicles, hydrogen power is developing quickly and holds advantages over electric vehicles in certain contexts, particularly heavy trucks, not least because the hydrogen fuel load of a truck is so much



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THE ART OF INNOVATION

Professor Linda Hill says 'collective genius' is key to success.

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KEY COMPONENT

Trelleborg's new jounce bumper solution is both durable and recyclable.



Cover photo:
Jordan Lye/mapo, Getty Images.
Montage by Appelberg.

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

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

www.trelleborg.com



Peter Nilsson,
President and CEO



EDGE COMBIWALL



Silence is golden

We all need peace and quiet from time to time, a space where we can be alone and focus on work, make a phone call or just take a break. Combiwall creates such spaces, and Trelleborg seals ensure they are soundproof.

TEXT ÅSA BEXELL HOFFMANN PHOTOS OLA TORKELSSON ▶

The story of Danish company Combiwall began in 2010, when long-time colleagues Flemming Berg and Bo Glad took on the task of creating an indoor glass wall system for a food market in Copenhagen, Denmark.

The requirements of the new marketplace involved both aesthetics and functionality. Not only did the solution need to let each individual shop have its own unique expression but it also had to be flexible; to permit the alteration of a wall in one shop without disturbing the commerce on the other side.

“This challenge gave birth to the Combiwall profile, which allows us to create glass walls that can

be double, single and framed – all contained in one unique profile,” says Glad, the company’s head of development.

Since then, the Combiwall company has developed its patented solution to include elegant doors, a sound-absorbing telephone box and wall panels on wheels that can move from one place in an office to another. The wall profile can have a range of configurations that combine different materials, such as wood, tiles and more.

“It is the same profile, whether you need a simple glass wall, a double wall where you can embed a whiteboard, sound-reducing materials or a screen, or if you need a framed wall,” says Glad.

“Open spaces are being remade, and in new workplaces private areas are one of the main elements of the construction.”

Bo Glad, Combiwall



Left: Bo Glad (left) and Flemming Berg offer flexible solutions that let companies adapt their office easily.



PHOTO: COMBIWALL

Above: The wall is the core of all Combiwall products. It allows a range of configurations and, made of glass with an aluminum profile, it is recyclable at the end of the life cycle of the product. Premium seals from Trelleborg ensure that the wall is soundproof.

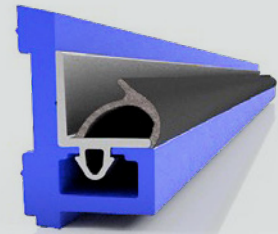


Glad says the uniqueness of the profile, with its multiple possibilities, is the secret behind Combiwall's success. Another reason could be the growing need for peace and quiet at work.

The Combiwall company has seen an increase in demand for walled-off areas of silence and privacy in offices and workplaces. Glad believes the open-office trend that

emerged in the early 2010s has failed to some extent.

"The idea behind it might be solid," he says, "but it didn't take a lot of things into account. The need for privacy and silence to focus was much bigger than anticipated, and a lot of times you saw a decrease in work efficiency where there was a lack of private offices or areas to retreat to. These days the tendency in office design



A unique solution

Trelleborg has developed a unique sealing solution on behalf of Combiwall, which includes:

- A customized and unique profile that is easy to assemble and disassemble.
- Outstanding sealing characteristics.
- Low-density cellular rubber for excellent noise reduction.
- Stable profile performance in big applications with moving parts, especially in the latest designs that require large profile sizes.
- Protection against elongation, meaning the profile will not stretch when mounted.
- Components and materials that can be reused once they're disassembled.

we see is quite different. Open spaces are being remade, and in new workplaces private areas are one of the main elements of the construction."

This trend fits well with Combiwall's business idea, which is to give clients a solution they can alter and change as the companies themselves develop.

"That's the main benefit with our wall system," Glad says. "You don't have to start all over every time things change for your company. The patented way we assemble and lock the wall makes it easy to alter – almost like Lego. And by reusing an existing wall, or part of it, you save both time and money."

It also makes Combiwall a sustainable alternative to most of its competitors. Its products are



not only reusable, which prolongs their life span, but they are also manufactured locally, using mainly Danish components, and can be recycled at the end of their product life.

A key factor in creating private and soundproof areas with glass walls is the seals. For Combiwall, the seals are as vital a part of the products as the profile itself, which is why the company chose Trelleborg.

“We started our journey with a standard seal, but soon realized that a standard seal did not cut it if we wanted every aspect of our product to live up to our high standards,” says Glad. “With Trelleborg we have developed and

then redeveloped the seal to make it perfect. This has made by far the biggest enhancement to our product.”

Glad says the quality of soundproofing today is so high that it makes a big impact when Combiwall sound-tests its products.

“We will keep adjusting the seals together with Trelleborg to ensure we always give our clients the best-of-the-best product on the market.”

“Creating spaces” has become Combiwall’s corporate mantra. These spaces should not interfere with their surroundings but rather complement them, which is why the walls are made of glass and designed to fit any need or situation.

Born out of the Danish

PHOTOS: COMBIWALL





Left:
Simplicity and elegance characterize Combiwall's solutions.

“With Trelleborg we have developed and then redeveloped the seal to make it perfect. This has made by far the biggest enhancement to our product.”

Bo Glad, Combiwall



minimalistic tradition, the design and look of Combiwall products are simple and elegant.

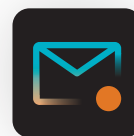
“We don’t want our products to stand out in a way that requires everything else to accommodate them in order for the space to feel complete,” Glad says.

One such product is the Combiwall telephone box, or simply “the box”. With its sleek, sound-proof glass walls, it integrates into any environment while ensuring that phone conversations stay private and do not disturb the rest of the workplace.

“We wanted to give our existing customers an alternative to the boxes already on the market, which we felt took a lot of attention from the office décor,” he

says. “Design-wise, our box is very different from the competitors. Not only is it built with the exact same profile we use for the walls, but our use of glass instead of wood for the sides make it light and more integrated. This also makes the box fit offices that don’t have our walls, as it does not steal attention but instead seems to fit right in.”

That ability to fit right in is the essence of Combiwall’s concept, and with flexible products that fit any environment, the possibilities to create spaces are endless. ■



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FLYING HIGH

Nina Winters has held a wide range of roles in different countries serving various industries during her 26-year career at Trelleborg. Today she is back in England, heading a team that develops solutions for some of the most innovative projects in sustainable air travel.

TEXT CHRISTINA ANDERSON **PHOTOS** SIMON BUCK

Nina Winters remembers sitting on the roof of her childhood home, a stone's throw from Birmingham International Airport, watching the planes take off and land. "Everyone got excited when a Concorde flew in to refuel," Winters recalls. "The whole house would rattle."

Now, as the leader of a New Product Introduction (NPI) team, Winters still has her eye on the sky. "Aerospace is an industry experiencing favorable growth and Trelleborg has a particular focus on it moving forward," she says.

In response to this, her team at the Cadley Hill facility in England

has grown, as has the site itself, which now includes a qualification test lab. The team is developing an in-house capability to test end products so that Trelleborg can offer aerospace customers a one-stop shop.

For more than 80 years Trelleborg has delivered aerodynamic seals, bearings and other components used in the interior and exterior of an aircraft, from engines, brakes and landing gear to window and door seals, fabrics and coated materials for escape slides.

Some of the most exciting new business is in the realm of green aviation. The aerospace industry is working hard to reduce its



As a child, Nina Winters would watch Concorde take off and land. Now she's piloting the future of aviation.



reliance on fossil fuels, improve fuel efficiency and test alternative propulsion systems, such as hydrogen, to make air travel more sustainable.

The aerospace team works with customers to optimize the design of aircraft components and find innovative ways to improve fuel efficiency. Measures include reducing aircraft weight by replacing heavier metals with composites. The aerospace team at Trelleborg develops lighter components with composites,

silicone and fabrics that provide a low-friction surface to a seal.

“The challenge is to create lighter-weight, heat-resistant materials that tolerate the higher temperatures generated in newer, more-efficient engines,” Winters says. “Fresh technologies are coming along in the aircraft industry, which is interesting and motivating for the whole team.”

The NPI team is looking at solutions for one of the most exciting innovations on the green aviation horizon, Urban Air Mobility.

Above: Nina Winters is leading the integration of a newly acquired aerospace company in Germany.

“Aerospace is an industry experiencing favorable growth and Trelleborg is having a particular focus on it moving forward.”

Nina Winters, Trelleborg

Nina Winters

Career: Twenty-six years with Trelleborg in a variety of roles serving the rail, automotive and aerospace industries – from development chemistry to project management. Winters holds a degree in polymer science and technology. Her various roles in Trelleborg Group took her to Malta, Shanghai, China, and Boston in the US; stints that whetted her appetite for travel.

Job: Manages a New Production Introduction team of eight people that generates new business and new solutions for clients in the aerospace industry.

Lives: After several years of travel and living abroad, now based in Solihull, England, not far from where she lived as a child.

Free time: Enjoys live music and traveling to far-flung places. With a friend from Shanghai, Winters drove more than 2,000 miles (3,218 km) through Namibia in nine days over Easter 2022.



Above: The next generation of engines is 25 percent more energy-efficient.

This includes electric, potentially pilotless air taxis for use in urban areas. These semi-autonomous vehicles, also known as electric vertical take-off and landing (eVTOL) aircraft, will ultimately carry people.

“The smaller ones can be electrified, and the hope is that they will be widely used and reach similar levels to car production,” Winters says. “Seals will be required on all those air vehicles, so there will be big opportunities for us as a company.”

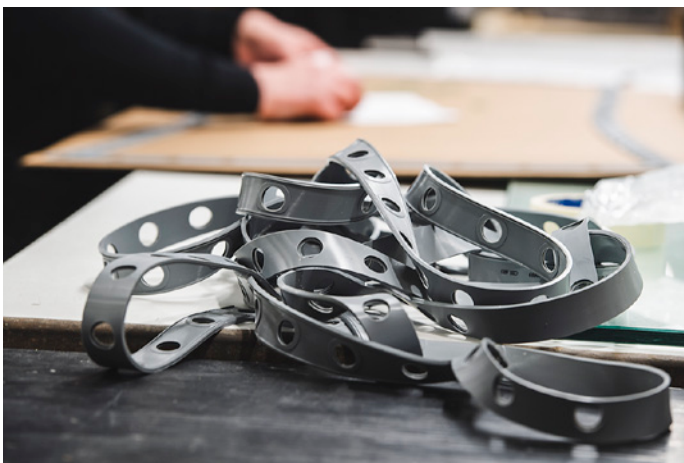
So far, the aerospace team has supplied new seals and grommets

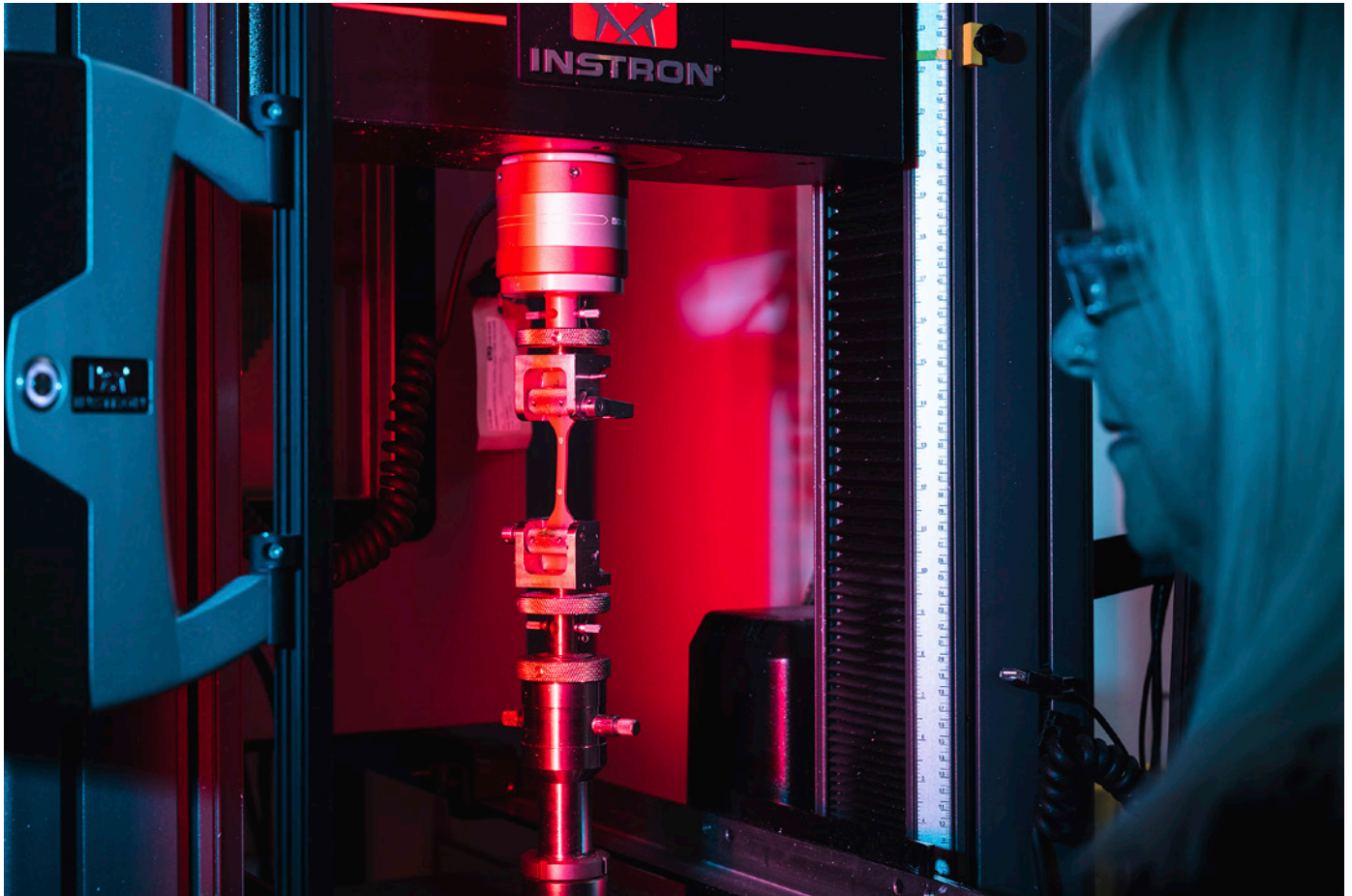
to a leading US-based eVTOL developer, and it is working on a range of fire protection and containment seals and gaskets for a similar company in Germany.

In 2022, the team also worked on components for the next generation of engines, which are 25 percent more fuel-efficient than earlier models. The engines will be used to test and develop solutions for sustainable air travel.

Although Winters has an affinity for airplanes, she hasn’t always worked in aerospace. She started as a development technologist

Below: Composites replace metal for lower aircraft weight and less fuel consumption.





in the lab at Woodville Polymer.

When Trelleborg acquired Woodville in 2001, Winters joined the company and ran a lab that developed formulas and materials for rubber mixtures. During that time Trelleborg expanded its aerospace business and Winters moved to work exclusively on aerospace – that is, until another opportunity arose. She has had several other roles within Trelleborg and worked in Malta, Paris, Shanghai and Boston before moving back to England.

More recently, she also took on managing the integration of a newly acquired German aerospace company based in Lindau. This role brings her in touch with many new people and functions, everything from the installation of IT infrastructure to the correct use of branding.

It is this range of roles and experiences that has kept Nina Winters at Trelleborg for more than 25 years. “Aerospace is never repetitive, in particular because each new airframe product is bespoke,” she says.

As a child in Birmingham, Winters once saw a Boeing 747 descend with a space shuttle attached. Another time she watched Air Force One land with President Bill Clinton on his way to a G8 summit.

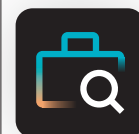
Today, Winters is flying in new iterations of the planes she watched as a child. When she takes her seat and looks out the window, she can spot the aerospace team’s work on the wings, and inside the aircraft as well. “It’s nice to see what we’re making,” she says, “and know that it’s important to the safety and performance of the plane.” ■

Above:

A silicon rubber sample undergoes tensile tests at the Materials Test Lab in Cadley, England.

“Aerospace is never repetitive, in particular because each new airframe product is bespoke.”

Nina Winters, Trelleborg



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NEWS



PHOTO: TRELLEBORG

More boots for Trelleborg

Trelleborg strengthens its world-leading position in the market for automotive boots with the acquisition of an India-based manufacturing operation from auto industry supplier, Injectoplast. The purchase of the operation, which has annual sales of around SEK 70 million, marks a key step forward for Trelleborg in the fast-growing Indian light vehicles market.

“We note a highly favorable sales trend for our automotive boots, and at the same time we have had a relatively low presence and sales in the Indian market,” says Jean-Paul Mindermann, President of the Trelleborg Industrial Solutions business area. “The acquired operation produces high-quality products in a state-of-the-art facility for the attractive Indian market.”



PHOTO: GETTY IMAGES

Wonderful time for schoolkids

One of Trelleborg's many community engagement initiatives is its strong commitment to helping schools promote STEM subjects (science, technology, engineering and mathematics), to inspire the engineers and scientists of tomorrow. Trelleborg, the UK National Space Centre and the parent-teacher association of Badgerbrook Primary in Leicestershire, England, teamed up to bring the Wonderdome, a mobile planetarium, to the school. The Wonderdome provided an engaging show, teaching the schoolchildren about space, the solar system, the planets and the wonders of the universe.

Thanks, Trelleborg!

Sometimes it seems like Trelleborg products are everywhere. Check out the famous Macy's Thanksgiving Day Parade that takes place in New York City each November. The floats in the parade have waterproof and UV-resistant fabrics made by Trelleborg's facility in Monson, Massachusetts, US. They are ideal for an event that often takes place in wintry conditions.



Sewer tech company in pipeline

Trelleborg acquires the German company Innovative Sewer Technologies, a key leading provider of complete solutions for pipe and sewer rehabilitation. In a market that will see healthy growth in the future, the strategic acquisition adds the specialized manufacture of machinery, robotics and liners used in trenchless pipe repairs to Trelleborg's current trenchless pipe repair offerings. The Bochum-based operation is a market leader in its area, with sales of about SEK 200 million in 2021.

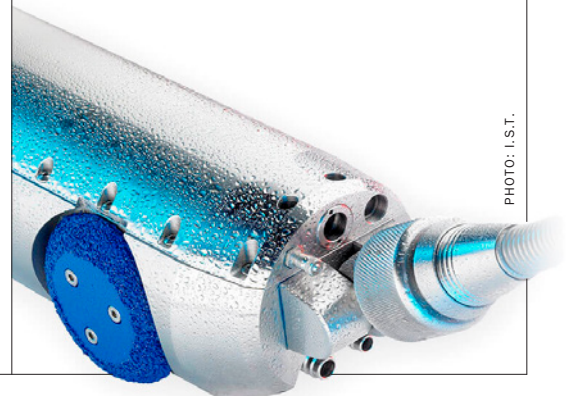
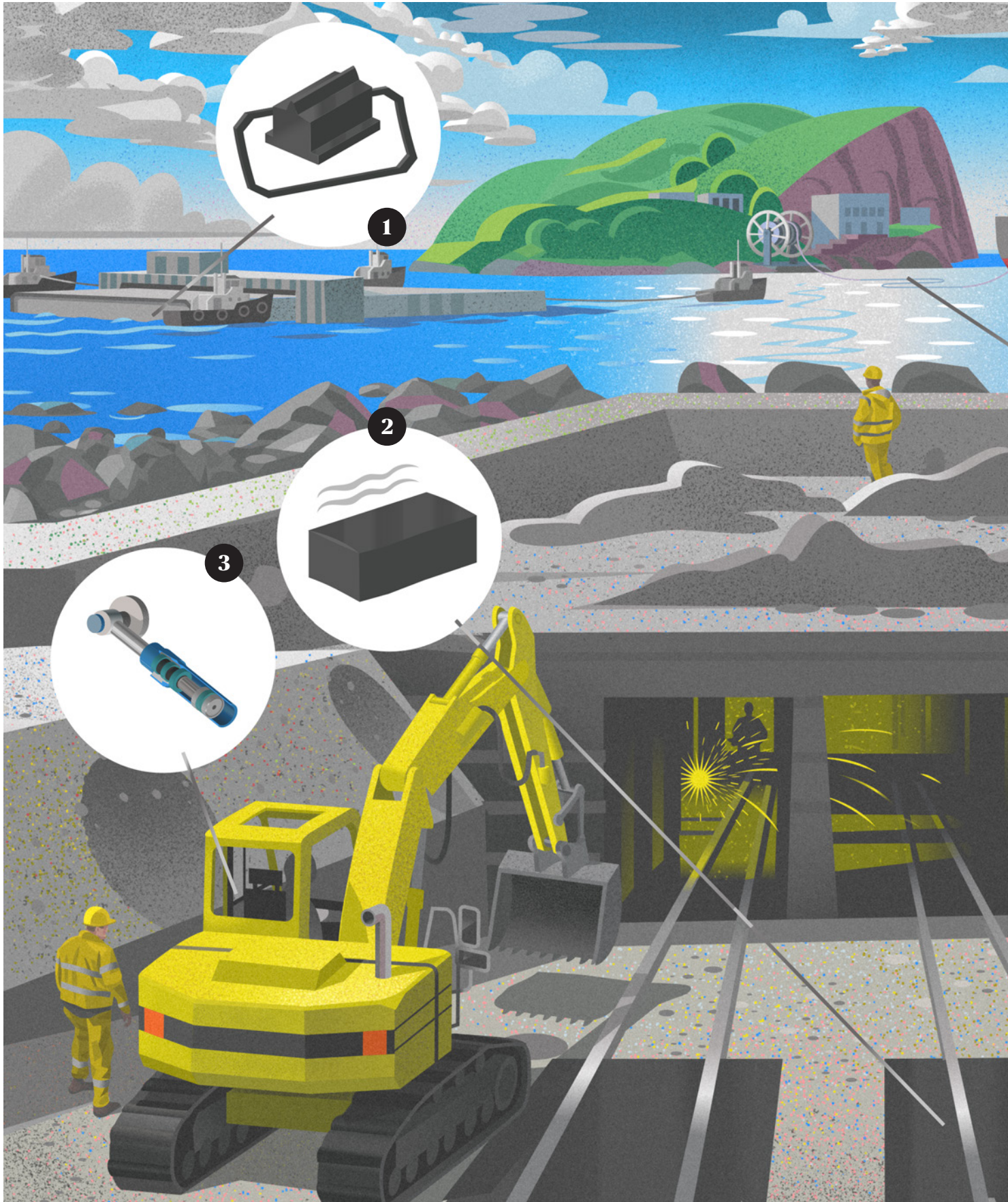


PHOTO: I.S.T.

EVERYWHERE RESILIENT INFRASTRUCTURE





TEXT KARIN LARSSON
ILLUSTRATION
 NILS-PETTER EKWALL

TUNNEL VISION

Remote locations often struggle to fulfill their energy needs and other necessities due to construction challenges. In environmentally sensitive areas, extra requirements exist for the building of necessary infrastructure that supports economic development and sustainable industrialization. Trelleborg contributes with both sustainable transport and resilient infrastructure.

1. Seals to keep tunnels dry

Seals for tunnels withstand high water pressure, as well as large movements in all directions.

2. Smoother, quieter railway

On the tracks, dampers and embedded rail systems reduce noise and vibration.

3. Protecting hydraulic systems

The hydraulic systems of off-highway machinery require high-performance, long-lasting sealing solutions that are compatible with lubricants and operate at high pressure in fluctuating temperatures, while minimizing friction.

4. Energy for remote locations

With floating cryogenic hoses, liquid natural gas (LNG) vessels can moor as far as 300 to 500 meters away from an onshore storage unit, bringing energy to remote locations.

5. Keeping wind turbines moving

Seals within wind turbines minimize friction, extend maintenance intervals, and ensure zero leakage, while being resistant to very high and very low temperatures.

6. Antivibration and suspension

Antivibration and suspension solutions prolong the life of off-highway vehicles, and increase productivity, while improving safety and comfort.



PHOTO: KYUSHU RAILWAY COMPANY

The Seven Stars train in Japan is a bucket-list experience.

Take the A train in Japan

Around the world there are a number of options for high-style rail travel, but the cruise train Seven Stars in Japan is among the world's most luxurious, offering shore-to-mountain sleeper tours around the island of Kyushu. The train only accommodates 28 passengers and if you want to climb aboard, apply far in advance! For aficionados of elegant travel, it promises to be a bucket-list experience.



PHOTO: TYER WIND

WINDY WORKS OF ART

Wind power is crucial to the clean energy revolution, yet some critics see wind farms as an ugly blot on the landscape. One producer seeking to address those concerns is Tunisian company, Tyer Wind. It has created a wind turbine with small, graceful blades that emulate the figure-eight flapping motion of a hummingbird, providing a different and arguably more aesthetic silhouette against the sky.

BOB WILL FIX IT!

Bob the Builder is a children's TV show produced in the UK. It began life in 1999 and now airs in 30 countries. In each episode Bob and his companions help with some renovation, construction, or repair, in the process teaching skills and emphasizing teamwork. Bob's catchphrase is "Can we fix it?" His companions respond with "Yes, we can!"



PHOTO: THE BBC

18

kilometers will be the length of the Fehmarnbelt tunnel, the world's longest immersed tunnel. Currently in construction, the tunnel extends under the Baltic Sea between Germany and Denmark, and Trelleborg seals are integral to its structure.

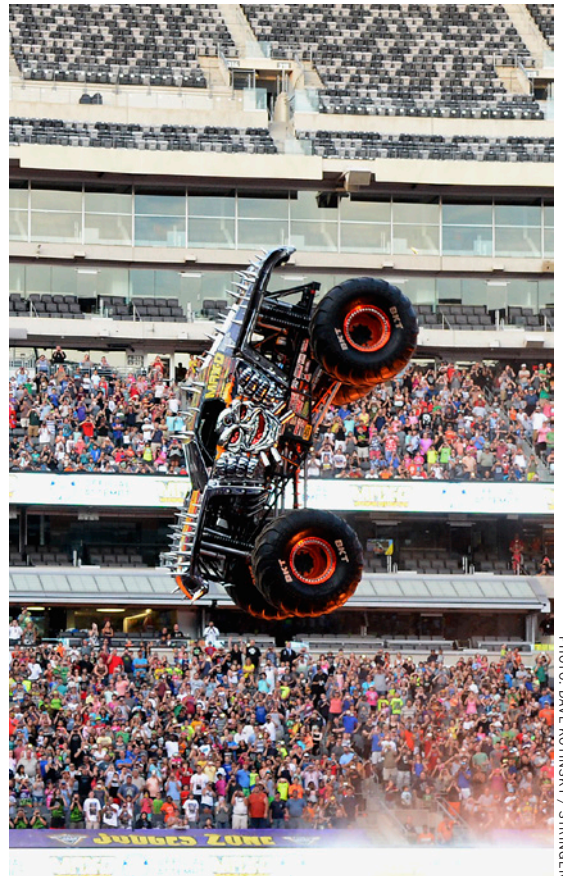


PHOTO: DAVE KOTINSKY / STRINGER

A MONSTER OF A SPORT

The Monster Jam World Finals is the annual championship event of the Monster Jam truck series, a US-based tournament that features outlandish trucks with enormous wheels competing in such events as "Racing and Freestyle," "High Jump" and "2-Wheel." In 2023, the finals take place in July at the Nissan Stadium in Nashville, Tennessee.

The next big thing

Hydrogen is the most common element in the universe, available all around us since time immemorial. So why is it only now being considered as a fundamental part of a more sustainable world?

TEXT DONNA GUINIVAN PHOTO GETTY IMAGES ►



PROTECTING THE ESSENTIAL HYDROGEN

Currently, around 51% of the hydrogen that is used in the global economy goes to refineries, and 43% as an input for ammonia synthesis, primarily in the production of fertilizers. The most common process for producing hydrogen is steam methane reforming (SMR). This is fossil fuel-based and consumes around 6% of the world's natural gas and 2% of its coal.

Hydrogen is rarely available in its pure form on Earth, so it requires extraction from compounds in which it is present. Any compound with 'H' in its chemical formula has hydrogen as one of its constituents, such as hydrocarbons, methane (CH₄) and water (H₂O). In fact, hydrogen makes up about 75% of the universe.

Although hydrogen is colorless, its different types are defined through a palette of colors that range from black (which comes from coal), pink (from nuclear), and turquoise (produced by pyrolysis of methane) to blue hydrogen (produced from natural gas with carbon capture technology), and what is currently the most common form, grey (extracted from coal gas). It is the source material and the production method that determine the extent to which the type of hydrogen is environmentally friendly.

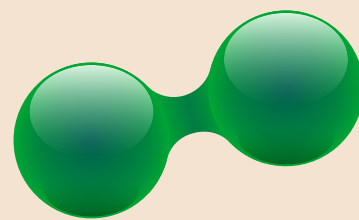
So, if hydrogen derives from fossil fuels, why is it being seen as such an important part of a sustainable future? The holy grail is completely carbon-neutral or 'green' hydrogen.

Green hydrogen is made by passing water through an electrolysis

cell powered by electricity generated from a renewable source, such as wind, solar or hydropower. The electricity divides hydrogen from oxygen, creating hydrogen gas at one electrode and oxygen at the other. The potential of green hydrogen in the sustainable energy mix lies in the fact that it can be burned in much the same way as natural gas is burned; and it can be run through a fuel cell, where it behaves in a similar way to a battery.

Though it has many uses, what has limited hydrogen's applications so far is its energy-intensive extraction process, which sometimes uses more energy than the energy that is produced. Fossil fuel-based grey hydrogen is relatively cheap; up until now, the greener the hydrogen, the more costly it is to produce.

However, this is changing as the production of green hydrogen becomes a more viable option and



Hydrogen: The facts

Hydrogen, H, is a gas (H₂) with an average atomic mass of 1.00794. The first and most abundant element on the periodic table, it is a constituent of most organic compounds, making up about 75 percent of the universe's overall mass.

The lightest of all elements, hydrogen is colorless, odorless and tasteless. Extracted from hydrocarbons such as methane in industrial processes, hydrogen rarely exists in its pure form on Earth.

Stars in the main sequence are mainly composed of hydrogen, and along with helium it makes up most of the composition of the Sun.



PHOTO: KRISZTIAN BOCSI/BLOOMBERG VIA GETTY IMAGES

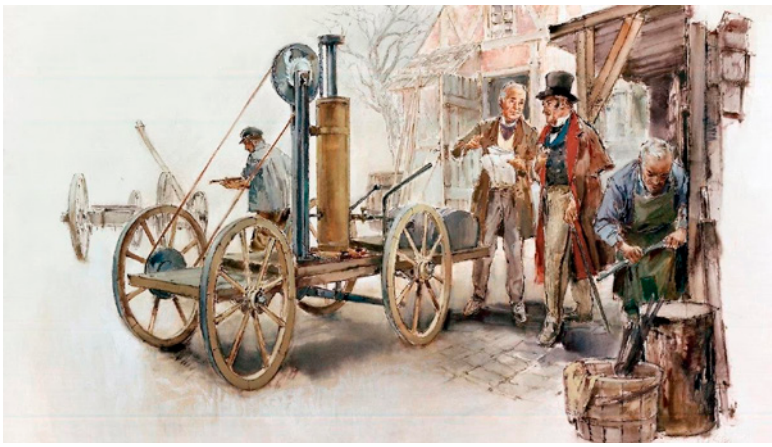


ILLUSTRATION: HANS LISKA



PHOTO: HONDA

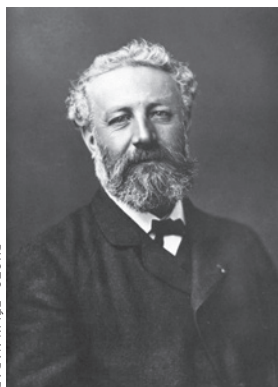


PHOTO: FELIX NADAR

Unbelievable foresight

French science fiction writer Jules Verne predicted in his 1874 novel, *The Mysterious Island*, that water, decomposed by electricity into its primitive elements, would “one day be employed as fuel, that the hydrogen and oxygen which constitute it... will furnish an inexhaustible source of heat and light.”

Above, from left to right:

A hydrogen fuel cell powered prototype railway train, manufactured by Alstom.

Since the 19th century, there has been an interest in hydrogen as an energy source for vehicles.

Honda ceased production of hydrogen-powered Clarity because of low sales.

75%

of the universe is made up of hydrogen.

to some extent, an essential one.

Fossil fuels are becoming more and more expensive and increasingly unacceptable due to their impact on climate change. They are also being used as a bargaining tool in geopolitical conflicts, so the push for a reduction in dependence on these fuels is becoming more urgent by the day. There is also pressure on governments, global bodies, and industry to slash greenhouse gases to meet the zero emissions targets they have set. Realistically, these are only achievable through substantial new solutions, such as green hydrogen.

In addition, initiatives like the United Nations Green Catapult, the U.S. Department of Energy Hydrogen Program, China’s long-term hydrogen plan and legislative proposals from the European Commission are all leading to hydrogen extraction becoming prioritized, more efficient, and thus

more cost-effective. Meanwhile, the falling costs of the production of solar and wind energy are significantly lowering the total costs of green hydrogen manufacturing.

So where will hydrogen feature in the sustainable energy mix?

Manufacturers will definitely be ‘greening’ the critical chemical processing applications that currently dominate hydrogen use. There will be a shift from grey to green hydrogen for fertilizer production, for instance.

What about hydrogen cars? In fact, the first four-wheel vehicle powered by hydrogen and oxygen was conceived as long ago as 1807. Even back in the 1970s and 1980s, many saw hydrogen as the answer to the quest for green automobiles. Jack Nicholson, the Hollywood actor, wowed onlookers in 1978 with a car fueled by what today we would call ‘green hydrogen’.

PROTECTING THE ESSENTIAL HYDROGEN

In the intervening period, battery technology has improved dramatically so that battery electric vehicles (BEVs) now rival traditional powertrains in terms of range – the distance travelled on one charge at an electric point or after filling up at a gas station. Most experts agree that batteries rather than hydrogen fuel cells have won the race for sustainable car technology, although Honda became one of the first original equipment manufacturers (OEMs) to offer a hydrogen fuel-cell electric vehicle (FCEV) to retail customers, in 2008.

For other types of vehicles though, batteries have their limitations and hydrogen could be a better option. According to SAE International, OEMs and global suppliers are looking to hydrogen propulsion as a solution for decarbonizing heavy transport. However, hydrogen has long the poor relation of the BEV, and it was only in 2020 that

Hyundai began producing its Xcient hydrogen-fueled truck.

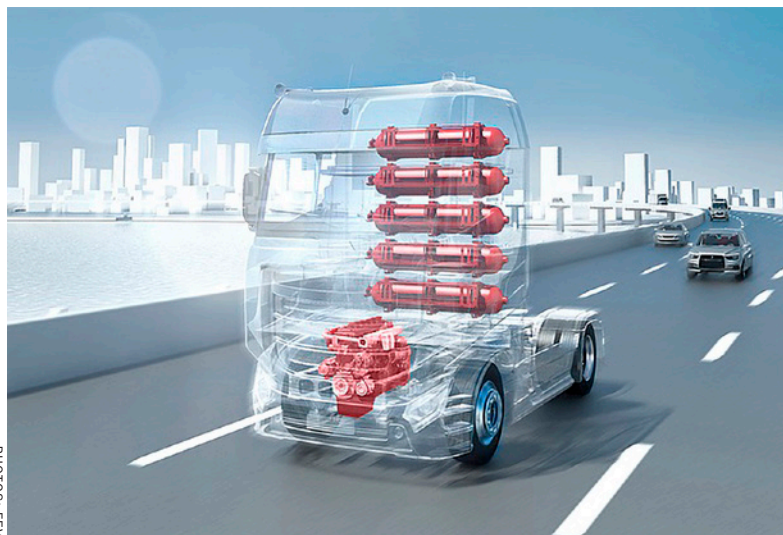
It's therefore unsurprising that, until now there has been limited uptake and acceptance of hydrogen vehicles. According to Information Trends, only 56,000 hydrogen-powered vehicles are on the world's roads in 2023, and very few of those are commercial or heavy-duty trucks. However, current breakthroughs in hydrogen technology could reduce fleet emissions while still providing reliable service with similar uptime to modern diesel trucks.

OEMs are focusing on developing the technology for difficult-to-electrify applications: for trucks that travel 400 kilometers or more daily and are being used in areas where the ambient air quality is low, or which have high duty-cycle applications (continuously in use for much of the day).

As a first step, most OEMs are concentrating on hydrogen-powered



“Only 56,000 hydrogen-powered vehicles are on the world’s roads in 2023.”



PHOTOS: FEV

87

million metric tons of hydrogen was the world's estimated demand in 2020.



Expanding hydrogen market

The demand for hydrogen reached an estimated 87 million metric tons (MT) in 2020, and expectations are that it will grow to between 500 and 680 million MT by 2050. In 2021 the value of the hydrogen production market was 130 billion USD and estimates are that it will grow up to 9.2% per year through 2030.

Left:

The company FEV believes hydrogen-fueled ICEs (internal combustion engines) and FCEVs (fuel-cell electric vehicles) can be implemented into the current production infrastructure of commercial trucks within the next five years.

ILLUSTRATION: GETTY IMAGES



PHOTO: JULIAN RETTIG/DPA, ALAMY



Enabling a hydrogen-fueled future

*James Simpson,
Trelleborg*

“The rapidly expanding market for green hydrogen represents a huge opportunity for Trelleborg. We boast an experience profile across a broad range of industries, and have tackled and solved some of the most demanding and critical sealing issues that have faced engineers. That puts us in a prime position to support our customers in the development of products and equipment that will enable the expansion of green hydrogen use, whether for more sustainable transport or the stabilization of electric grids powered by renewable energy.”

engines that utilize current technology and chassis. However, FCEVs could eventually provide a long-term solution to decarbonizing long haulage trucking. Hydrogen fuel cells offer great promise for heavy-duty trucks in applications requiring a higher density of energy, fast refueling and additional range.

Beyond this there are also pressures on the shipping industry to lower its carbon footprint. Ships currently emit 3% of the world’s greenhouse gases. Several projects are underway, testing how hydrogen and other fuels made from it, such as ammonia and methanol, could power a low-carbon maritime industry.

Another area of interest is long-distance rail, and here technology is already a reality. Alstom’s Coradia iLint™ is the world’s first passenger train powered by a hydrogen fuel cell; in September 2022 it reached

a new world record distance of 1,175 kilometers on a single filling.

The most significant sustainable application for hydrogen is its potential role in the stabilization of the electricity grid. This is because hydrogen is produced from electricity, is storable and has the capability to be converted back to electricity.

Renewable energy is inherently intermittent as it is dependent on when the sun shines or the wind blows. Although the efficiency of solar panels and turbines keeps increasing, there is a need for an alternative source when there is no energy generated. Currently, coal gas is the back-up and that is unsustainable due to its climate impact.

The panacea is filling that gap with green hydrogen. When there is peak production for wind and solar, turbines and panels produce

Above:

In December 2022, DEKRA hosted the hand-over of Germany’s first series-produced hydrogen truck with road approval. DEKRA is a leader in the TIC sector (Testing, Inspection, Certification).



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more energy than is needed for the electricity grids they supply, so they shut down. That results in a loss of up to 20% of renewable energy’s capacity.

Major investment now focuses on integrating hydrogen with renewables. Instead of switching off panels and turbines at peak production times, the excess electricity would divert to produce green hydrogen, which goes into storage facilities. When the grid needs energy, the hydrogen would be converted back to electricity.

It is hard to believe that Jules Verne predicted in the nineteenth century that the elements of water decomposed by electricity would one day provide an inexhaustible source of heat and light. Finally, his vision is materializing 150 years later, and hydrogen will be a critical component in the creation of a sustainable world. ■

Breakaway couplings have been protecting the world's oceans from offshore tanker incidents for over 40 years. We explore what they are and where they come from.

Breakaway benefits

TEXT DONNA GUINIVAN
PHOTOS GALL THOMSON

As the world works to build renewable sources to fill its power needs, fossil fuels continue to play a crucial part in the global energy mix. Thus, it is vital that solutions are available that can alleviate critical risks. One of these hazards is damage to hoses involved in the transfer and transport of crude oil by sea.

According to Statista, a market-leading statistics portal, global transport of crude oil on the ocean reached around 1.83 billion metric tons in 2021. Expectations are that seaborne transportation will remain the preferred choice over fixed pipelines, which are expensive and difficult to install, operate and repair, especially offshore. These pipelines have also been the subject of geopolitical battles recently, which is likely to be a further impetus for water-based shipping.

Ultra large crude carriers (ULCC) – the biggest of oil tankers – can carry 500,000 deadweight tonnage of crude oil. They are part of a diverse infrastructure that also includes a variety of floating production, storage and offloading vessels as well as single point mooring and conventional berth mooring terminals.

UK company Gall Thomson is a world leader in the application, design and supply of marine



breakaway couplings (MBCs). Max Virgin, Managing Director of the facility that manufactures Gall Thomson MBCs, says, “The Gall Thomson Marine Breakaway Coupling is an essential safety element when one vessel transfers hydrocarbons to another vessel or terminal via a hose at sea. It is installed between two sections of the transfer hose. If an incident happens, be it a tanker breakout or damaging pressure surge, the MBC will automatically part without the need for human intervention. Petal valves in both halves of the MBC body will close, either in a controlled manner in the upstream side, or instantaneously in the downstream. This prevents environmental pollution and protects expensive hose assets.”

Offshore hose-parting incidents are not an everyday occurrence, but they do happen, running at around one per month globally. If a hose transfer system is unprotected it could result in a significant pollution event, damage to terminal assets, terminal downtime, loss of revenue, negative media attention and damage to an operator's reputation, not to mention government fines and in some cases legal action against those deemed responsible.

“We monitor incidents involving our MBCs and can see from this analysis that the most common cause of an activation is extreme weather conditions,” continues Max Virgin. “Such conditions lead to excessive movements between two vessels or a vessel and its mooring. The stress would be enough to



Left: Tanker operations associated with offshore assets such as Single Point Mooring can be hazardous. Gall Thomson MBCs reduce the consequences of an incident.

“We work on the basis of evolution, not revolution, continually improving on an already excellent design.”

Max Virgin, Gall Thomson



40 years of field data incorporated into our designs is a major reason for this.”

Another issue with competi-

tor couplings is auto-submergence. “If a coupling is too large and heavy, a phenomenon called auto-submergence can occur when it activates,” Max Virgin says. “If a hose end goes under the water by more than three meters, the MBC can sink the entire hose string, making the hose string unusable and potentially costing the operator millions of dollars for a replacement. To prevent this issue, the Gall Thomson MBC is compact and lightweight and comes with buoyancy modules where necessary, so it will not sink the string.”

As the MBC has been around for 40 years, are new developments planned?

“Reinventing a solution that is already successful is not necessary,” says Max Virgin. “We work on the basis of evolution, not revolution, continually improving on an already excellent design. This helps us to continue to utilize our proven technology and brings piece of mind to our customers. They know they are not using untested equipment with little or no field experience. Instead, we are supplementing our offering with additional products that enhance the coupling’s performance in line with vessel operators’ needs.”

The recently launched Protected Transfer System works in conjunction with the MBC, offering an option of active release of a transfer system to prevent damage in an unforeseen emergency. ■

burst a hose, but instead the MBC activates and there is a controlled separation of the hose into two parts.

“To provide 100 percent containment, couplings would have to close instantaneously,” he continues. “However, too rapid a closure can cause a surge to bounce back up the transfer line, which could have serious consequences in terms of hose rupture. During a controlled closure, a negligible amount of oil will escape into the sea, but it is nothing compared to an oil slick that would occur if no MBC was in use.”

Invented back in the 1970s, the Gall Thomson MBC is the market leader. Though now more than 40 years old, it remains the foremost product of its type, with an experience curve unmatched by any other similar solutions. It is fitted in most offshore terminals involved in critical hydrocarbon transfers.

“We are sometimes under pressure from new entrants into the market but generally their technology is not comparable to ours and end users see their offerings as experimental, without field experience in this critical application,” Max Virgin points out. “Operators usually do not want to take the risk of using another coupling. For example, many of the few MBCs supplied by our competitors have been the subject of spurious activations, when the couplings activate for no reason. This is extremely rare for Gall Thomson MBCs. It only occurs if the couplings are poorly maintained or if they have suffered abuse. The experience of over

Left: MBCs in reeled applications offer particular challenges that have been uniquely overcome with Gall Thomson R&D based in-field proven experience.



Marine breakaway couplings applications

- Single point mooring, floating storage and offloading and floating production storage and offloading, floating storage unit and other offshore oil terminal production and transportation systems employing reeled, floating and in-air and submerged catenary hose strings.
- Under-buoy and conventional buoy mooring and multi buoy mooring submarine hose strings.
- Gall Thomson is a Trelleborg company.



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Right:
Linda Hill was named by Thinkers50 as one of the top ten management thinkers in the world in 2013 and 2021.

LET'S WORK TOGETHER

How is it that some companies manage to innovate time and time again, while others fall behind? Linda Hill has spent decades seeking answers to that question.

TEXT PATRICK GOWER PHOTO SUSAN YOUNG

Linda Hill, a professor at the Harvard Business School in the US, has spent decades thinking about innovation and leadership – specifically how leaders at companies such as Volkswagen, Google, eBay and Pfizer create and sustain cultures that ensure innovation happens and, crucially, keeps happening.

Hill, co-author of *Collective Genius: The Art and Practice of Leading Innovation*, defines innovation as “anything that is both creative and useful” – a definition that incorporates both incremental progress and the breakthroughs that revolutionize entire industries. Her research pioneers a democratic form of leadership over the “visionary” model made famous by the late Steve Jobs at Apple or Tesla’s Elon Musk. Hill’s research suggests that solo genius or flashes of inspiration are

much less important qualities for leadership than the ability to unlock the “collective genius” of those working in the broader organization.

Successful leaders “seek to make sure that everyone in the organization understands that they have a role to play in innovation,” Hill says. “They have a very democratic notion of innovation, and they focus on building the capability in the organization for everybody to be willing and able to play a role, whether participants are developing a product or service, a business model or a way of executing better.”

This sounds simple, until you consider the balancing act required to make the process work. Innovative companies are nurturing enough to ensure that everybody speaks up, yet disciplined enough to ensure that





Linda Hill

Job: Wallace Brett Donham Professor of Business Administration at the Harvard Business School and Faculty Chair of the business school's Leadership Initiative.

Lives and works:
Boston, Massachusetts, US.

How do you spend your free time?
Visiting museums, libraries and beautiful places in different parts of the world.

What motivates you?
The opportunity to learn from my students and executives that I meet as I teach and do research.

time isn't wasted on bad ideas. They are purposeful enough to ensure that resources are used effectively, while recognizing that you can't plan your way to innovation. They create enough safe space to ensure that competing ideas are heard, while fostering the conditions for creative differences to be debated and resolved.

These tensions can be navigated by utilizing three capabilities that appear in every organization that innovates successfully, says Hill, whether it is an Islamic bank in Dubai or a luxury brand in Korea.

The first is creative abrasion. Successful leaders "know how to get people to advocate for their point of view because it's a competition of ideas," says Hill. "You need that abrasion."

Creative abrasion can be particularly difficult within cultures that place a high value on being polite. When Hill studied Pfizer, "a very polite culture with deep respect for expertise," interacting with highly qualified scientists or researchers could at times damp down the ability of staff to say what they were really thinking. The company introduced a series of norms and activities to help staff speak up, including "straight talk" coins that anybody could place on the table when they sensed a meeting was skirting around the key issue.

"That stopped everybody," Hill recalls, "because when somebody placed that coin on the table, it really meant 'Are we really talking about what we need to talk about, given our shared purpose – putting patients first?'"

The second is creative agility. "Innovation is the result of acting and experimenting in an iterative way, and learning as efficiently as you can," says Hill. "Successful leaders really work on that capability."

Teams within agile companies can work contrary to what their instincts are telling them. When Hill studied medical staff at the Cleveland Clinic Abu Dhabi, their practice was understandably to wait and gather as

much data as possible before making decisions. However, during the pandemic, where speed mattered, they had to learn how to make decisions based on limited and ambiguous data.

"It's vital to install a mindset that everything is a working hypothesis with incomplete information," says Hill. "What really matters is how fast we can learn about the impacts of our decisions. It's about asking, can we act our way to a solution as opposed to thinking we can plan our way?"

Creative resolution is Hill's final capability. Encouraging teams to be bold enough to act on incomplete information and to challenge





ILLUSTRATION: GETTY IMAGES

“If as a leader you think your job is to have a vision and say, ‘Follow me to the future,’ that does not lead to the culture and capabilities that allow for co-creation.”

Linda Hill

resolve their creative differences and choose a more optimal “both-and” solution in the long run.

Successful leaders build organizations that don’t let one group dominate, but they also don’t just go for consensus, Hill says. “Instead, they kind of work through those differences, so they take full advantage of that diversity of thought and of the learning that has happened as they’ve been experimenting.”

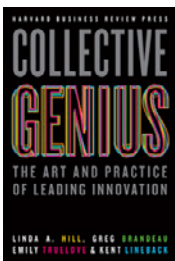
There is, says Hill, “no magic to any of this.” Rather all three capabilities can be implemented through deliberate changes in leaders’ behavior or team processes. Indeed, it’s often a number of small changes that create the mindsets, behaviors and conditions that unlock the collective genius found in every group.

“If as a leader you think your job is to have a vision and say, ‘Follow me to the future,’ that does not lead to the culture and capabilities that allow for co-creation,” Hill says. “It’s more about saying, ‘Let me invite you to help me co-create that future.’” ■

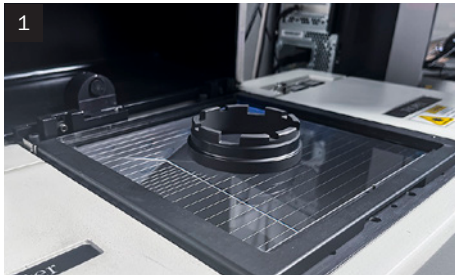
each other’s ideas by definition creates conflict and tension, which is where creative resolution comes in.

When Google sought to increase its data storage capabilities, the head of the engineering and infrastructure group opted not to form a group to tackle the task directly, and instead allowed groups to emerge spontaneously around various alternatives.

Running parallel experiments might sound inefficient, but it prompted learning and development rather than simply fostering an environment that coalesced around a single idea. Allowing two teams to test their ideas clarified the pros and cons of each approach and laid the foundation for the groups to



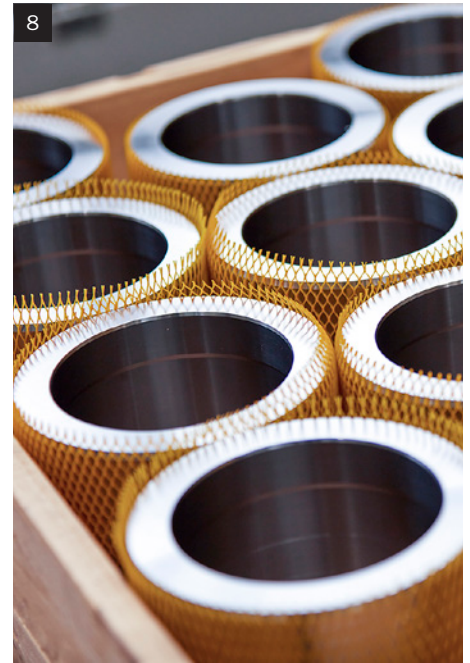
Left: Published in 2014, *Collective Genius* has become a modern classic in business literature.



A quality partnership

Used worldwide, mechanical seals from German manufacturer Metax stand up to demanding environments such as refineries and chemical plants. Important components in these seals are O-Rings made of Trelleborg's Isolast material.

TEXT JOHANNES WENDLAND **PHOTOS** ERIC REMANN AND METAX



1. The evenness of the sliding surfaces of the mechanical seals is important. Metax therefore relies on state-of-the-art measuring technology.

2. From a small village in Hesse, Germany, Metax supplies customers worldwide.

3. Beside various stainless steels, brass and aluminum, Metax also processes special alloys.

4. Based on their experience, long-standing employees are an important part of ensuring consistent quality.

5. High quality elastomers, like Trelleborg's Isolast®, complement the performance of Metax's mechanical seals.

6. Customized laser labelling has become a must in recent years.

7. Metax focus on customer-specific solutions.

8. From individual and single production to series production, Metax produces according to customers' needs.

9. The close proximity and exchange of ideas between Metax's engineers and in-house production are very important, especially for special solutions.

10. A five-axis milling machine at work.

11. Burr-free components are particularly important for the operation of elastomer seals.

12/13. All production employees program their machines themselves in accordance with the production drawings.

Continues on page 30



In South America, a chemical facility had problems with a pump used to convey liquid sulfur. Given the aggressive nature of the media, the seals in the pump needed replacing every three months. In addition, leaks caused by accumulations of crystallized sulfur around the pump were common.

There was an urgent need for maintenance and cleaning and, ominously, the workforce and the local environment were at risk of being exposed to dangerous chemicals. Meanwhile, because of the need for frequent maintenance work, long downtimes were a regular occurrence.

To rectify these issues, the operator of the chemical plant turned to Metax Kupplungs- und Dichtungstechnik, based in Hungen, Germany. The company has a good reputation, thanks to a history of state-of-the-art, and in most cases, customer-specific solutions.

For the South American manufacturer, Metax designed a single-acting seal with materials that are especially suitable for contact with crystallizing media. By integrating a heating chamber and quench seals, crystal formation at the seals could be largely prevented. This resulted in a noticeably extended seal service life and a reduction in maintenance.

Right:

It's important to measure after each production step.

“Ninety percent of the failures of mechanical seals are due to the failure of the elastomer within them.”

Hans Düringer, Metax



Left:

Hans Düringer has over 30 years of experience as engineer in the sealing industry.

PHOTO: ERIC REMANN

PHOTO: ERIC REMANN



About Metax

The family company Metax Kupplungs- und Dichtungstechnik GmbH, founded in 1985 and based in Hungen, Germany, specializes in the rotary sealing of machines in plant construction and process engineering. Its main products are application and customer-specific mechanical seals and supply systems. Metax also offers other sealing systems, pump monitoring systems and rotary joints. Its customers primarily include refineries and the food industry. Metax has 50 employees.

Key to the solution was O-Rings made of Trelleborg's Isolast®, a material characterized by an extremely high chemical and temperature resistance that makes it ideally suited for demanding applications in chemical plants.

Metax has relied on Trelleborg products for its sealing solutions for many decades. "Ninety percent of the failures of mechanical seals are due to the failure of the elastomer within them," explains Hans Düringer, Technical Manager at Metax. "O-Rings can swell, rupture, or fail with a sudden increase in pressure. You can only

minimize these failures if you have a suitable partner who advises you on the selection of the right materials."

"When it comes to O-Rings, there is a wide variety of types and applications," explains Düringer's son Thomas. Thomas Düringer works as a technical consultant in the sealing industry. "There are many different material compounds developed for very specific conditions," he says. "Isolast is currently ahead of competing materials. Trelleborg knows exactly how to formulate it perfectly so that the O-Ring is just right for the application in question."

CASE METAX

Apart from Trelleborg's material mixes and technical advice, Hans Düringer says he particularly appreciates the company's willingness to cooperate, including allowing Metax to use Trelleborg's laboratories for development projects. Trelleborg also provides training courses, which Düringer says almost all the company's employees have completed. "This is very important for us," he says. "With the knowledge we acquire we can give our customers competent advice when it comes to the selection of O-Rings."

At Trelleborg, Marco Schildknecht, Segment Manager in Europe for the chemical and

process industry, reflects on the collaboration. "Metax has a high level of expertise in the field of mechanical seals and is considered by the industry as a real know-how carrier and problem solver," he says. "However, the manufacturing of O-Rings is a specialist area because there are many thousands of options involved. And this is the expertise we bring to the Metax customers."

With Metax, Trelleborg benefits from a customer with well-regarded products in the market. The same applies in reverse, says Schildknecht. "One quality supplier helps another quality supplier," he says. ■

Below:
Overview of different types of sealing components.



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“Isolast is currently ahead of competing materials. Trelleborg knows exactly how to formulate it perfectly so that the O-Ring is just right for the application in question.”

Thomas Düringer



PHOTO: ERIC REMANN



Isolast® O-Rings

The Isolast® range of perfluoroelastomers (FFKM) from Trelleborg, combines the positive properties of high-performance polymers. The material has the elasticity of an elastomer along with the high chemical and temperature resistance of a polytetrafluoroethylene (PTFE). This makes it particularly suitable for applications in the chemical industry and refineries.

Components such as O-Rings made from Isolast are ideal for extreme environments where they are in contact with aggressive media and subject to extreme hot or cold temperatures. Isolast seals provide extended life even under the most demanding environmental conditions.

NEWS



PHOTO: GETTY IMAGES

Safe piloting in the Panama Canal

Trelleborg has developed a new fixed-installed piloting unit, SafePilot P3, in response to updated ship positioning requirements for Panama Canal transits. The canal authority's new regulations apply to NeoPanamax vessels and take effect in October 2023. SafePilot P3 provides real-time certified data to and from the pilot's display, enabling more efficient operations in constrained waterways with heavy traffic.

Welcome to the new chairman

Johan Malmquist is the new chairman of the board of Trelleborg AB. He was elected at Trelleborg's 2023 Annual General Meeting, which took place on April 27, 2023. Malmquist, who was previously a member of Trelleborg's board, succeeds Hans Biörck, who chose to step down after five years in the role.



PHOTO: TRELLEBORG

Snap-happy staff

The Trelleborg Employee Photo competition aims to show a more human side to Trelleborg's social presence. Showcasing the fantastic photographic talent of employees in Trelleborg Group, below is just one example of the many great entries received. The best appear on Trelleborg's Facebook, LinkedIn and Twitter accounts.

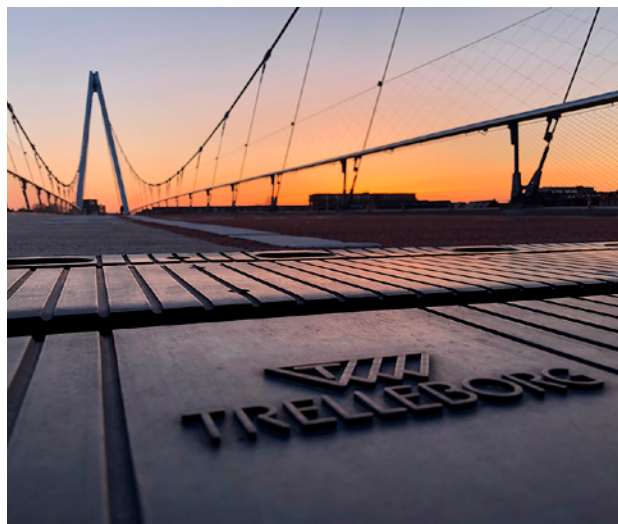


PHOTO: DENNIS DE JONG



New safety targets

Following the success of Trelleborg Group's Safety Day in 2022, the company has now introduced ambitious new safety targets. Underlining its prioritization of workplace safety, the Group aims to reduce the number of injuries and lost-work cases by half over the next three years.

Keep me in suspense

The new jounce bumper from Trelleborg and Celanese combines four parts into one recyclable solution, meeting cars' suspension needs in a sustainable way.

TEXT PATRICK GOWER **PHOTO** GETTY IMAGES

Jounce bumpers are found on every passenger car. Because the technology can help reduce noise, it may have extra appeal for manufacturers of EVs. Reducing noise in the cabin of EVs is a significant issue in the industry.

The automotive industry is under acute pressure to cut carbon emissions. It has reduced its carbon footprint by five percent since 2018 and is on track to further reduce greenhouse gas emissions (GHG) by another 19 percent by 2030, according to a 2022 report by the Capgemini Research Institute. But the study finds that even this progress leaves manufacturers falling behind in the push to hit net-zero emissions by 2050 under the Paris Agreement.

In response, auto makers are now

seeking new methods to go green, whether by using less carbon-intensive materials or through the introduction of more circularity into the components they adopt.

“Sustainability has been important to the automotive industry for a long time, but during the past year we’ve seen increasing numbers of our customers come to us to see if we have new solutions to help them be more sustainable,” says Thomas Leblois, who heads up the Trelleborg boots operation.

One area of the car that is now subject to manufacturers’



sustainability ambitions is suspension, which plays a critical role in ensuring the comfort of drivers. In particular, jounce bumpers are components within the suspension system that absorb impact and dampen noise and vibration. They prevent metal shock absorber springs from fully compacting during impacts caused by potholes, curbs, objects in the road, or sharp maneuvers, thereby preventing damage to the car.

A new jounce bumper solution from Trelleborg and Celanese conforms to the sustainability and circularity requirements the automotive industry needs to meet regulatory and consumer demands. The Hytrel® thermoplastic elastomer suspension component can integrate up to four parts into one, making it both durable and recyclable at the end of a vehicle's life.

"Our jounce bumper utilizes innovative materials and designs to offer customers a new, completely recyclable solution," says Leblois.

Jounce bumpers are usually made up of crosslinked polyurethane foam (PUR) but the solution from Trelleborg and Celanese utilizes a blow-molded, hollow Hytrel thermoplastic elastomer. The product does not require a separate base cup or ring and has integrated dust protection. It has a snap-fit assembly for greater durability and eliminates contact with the strut, so there is no added friction, abrasion, or noise. In tests, the product has shown to perform with greater consistency over temperatures ranging from -40°C to +140°C, including retaining its compression. Most importantly, vehicle

How it works

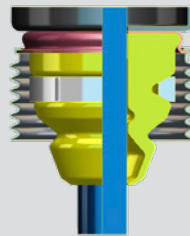
Jounce bumpers absorb impacts and dampen noise by preventing suspension components from fully compacting after hitting potholes, curbs or objects in the road, even while carrying heavy loads.

Traditionally, the components are formed of four parts: a base cup, ring, the jounce bumper and dust cover. The product designed and manufactured by Celanese and Trelleborg has a reduced

number of parts as it has no base cup or ring, along with integrated dust protection.

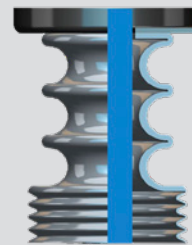
The Hytrel® thermoplastic elastomer that forms the jounce bumper is more durable than the polyurethane foam found on traditional jounce bumpers. And unlike polyurethane foam, the Hytrel thermoplastic elastomer solution can be reground and reused at the end of a vehicle's life.

ILLUSTRATIONS AND TEXT: CELANESE



Polyurethane foam: 4 parts

- Base cup
- Ring
- Jounce bumper
- Dust Cover



Hytrel® TPC-ET: 1 part

- No base cup
- No ring
- Jounce bumper integrated with dust protection



Above:
Thomas Leblois,
Trelleborg.

comfort, safety and handling are just the same with the Trelleborg and Celanese solution as with the traditional one.

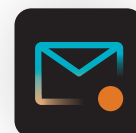
Once the car reaches the end of its life, the Hytrel thermoplastic elastomer solution can be reground and reused. Celanese developed the material and designs and it holds a patent for the technology. Trelleborg has the expertise and machinery to manufacture the parts to the highest quality at scale.

"It's a great opportunity for Tier 1s and original equipment manufacturers (OEMs) to have a more sustainable offer for automotive suspensions," says Thierry Donis, Automotive Development Engineer at Celanese. "Trelleborg is hugely innovative in its thinking and the way it produces products, which is why we formed our partnership with them for this product. We're confident that the offer of a single, recyclable, lightweight

part that is easy to identify and disassemble from an end-of-life vehicle will be popular among OEMs that are seeking new ways to be more sustainable."

Finding brands to adopt the new technology is the next challenge, according to Thomas Leblois. Though eager to find new solutions, the industry is generally risk averse and conservative when it comes to the adoption of new products.

"Convincing OEMs to move to a new technology is always challenging, but as soon as you open the door the rest of the industry tends to follow," he says. "The sustainability demands are now so serious that we are confident we'll find adopters." ■



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Protecting the essential

OPERATIONS

COMPLIANCE



SOCIAL
ENGAGEMENT



PROTECTING THE ESSENTIAL

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