t·time

A MAGAZINE FROM TRELLEBORG GROUP | 1·2024

Solutions for critical applications in demanding environments.

PLUS

INNOVATIVE TECH FOR MORE SUSTAINABLE AIRCRAFT

ARCHITECTURE THAT RESISTS CLIMATE CHANGE

A BRIGHT FUTURE FOR AI

Big movers

The safe maneuvering, docking and mooring of mega ships

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EDITORIAL

Giants of the ocean

It is difficult to comprehend that the largest container ship in the world, the MSC Irina, is 400 meters long. That is the equivalent of just under four soccer fields in length! As ships reach gigantic proportions, mooring them becomes ever more challenging. As you can read in this issue of *T-Time*, ports are often in historical locations with limited opportunities for expansion. Read how Trelleborg supports the safe, efficient and sustainable docking and mooring of mega ships.

The pros and cons of AI, artificial intelligence, are a subject of debate. In Trelleborg, we began looking at the possibilities of AI back in 2017. Today, we use AI for tasks such as automated inspection, and are gathering process data for our AI projects of the future. AI advances fast, and, like all who explore it, Trelleborg investigates ways to take advantage of its many opportunities for enhancement and better ways of working.

Enjoy your read!

Peter Nilsson,
President and CEO

Cover photo:
Greg Pease, Getty Images.

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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 34 billion in 2023 and operations in about 40 countries.

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

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TRELLEBORG

SAFE SAILING

As ships reach gigantic proportions, maneuvering, docking and mooring them becomes ever more challenging. Trelleborg supports bringing these giants of the ocean into port efficiently and sustainably.

TEXT DONNA GUINIVAN **PHOTOS** GETTY IMAGES

The World Economic Forum estimates that 90 percent of the world's goods are transported by sea. According to the International Chamber of Shipping, that amounts to 11 billion tons of product every year, or 1.5 tons for each person on earth.

This level of shipborne traffic puts intensified pressure on operators and ports to increase efficiency and improve sustainability. One of the main solutions to this challenge reflects a principal trend in the maritime industry: the development of mega ships.

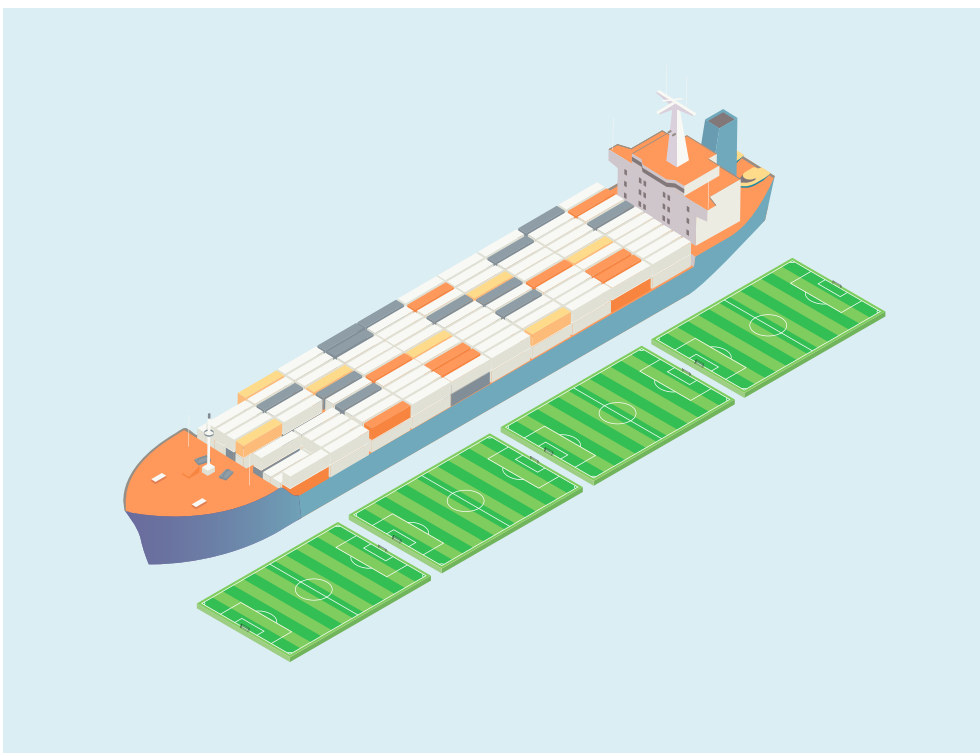
"There are new, bigger and faster container ships every year," says Tommy Mikkelsen, Managing Director for navigation and piloting at Trelleborg, who is involved in the specification of Trelleborg's marine products to ports globally. "Ships are becoming larger and larger."

The early container ships of the mid-1950s were 137 meters or 450 feet long, six containers wide and held just four containers on top of one another above and below water – eight altogether.

Contrast that with the MSC Irina, which is currently the largest container ship in the world. Launched in April 2023 from Guangzhou Port in China, it is 400 meters or 1,312 feet in length. The MSC Irina is three times longer than a ship from the 1950s. It is also much wider and can carry at least ten 20-foot containers across its girth, 26 of which can be stacked on top of one other.

The main driver for larger ships is undoubtedly economies of scale as the bigger a ship, the more cargo it can carry. In addition, the sustainability agendas of big shipping companies, such as Mersk, MSC and CDMA, are a key factor.

"When it comes to sustainability," says Mikkelsen, "our customers are under



Tommy Mikkelsen, Managing Director for navigation and piloting at Trelleborg.

Above: The largest container ship in the world, MSC Irina, is 1,312 feet. That is just under four soccer fields in length. The ship can accommodate up to 26 layers of containers.

“One of the things that we as a technology partner do is to innovate and find groundbreaking solutions that will allow larger ships into ports.”

Tommy Mikkelsen, Trelleborg

extreme pressure. It is part of the conversation everywhere. This was not the case five or six years ago; it’s really changed.”

The more cargo a ship carries, the lower the carbon footprint of the goods onboard, pound for pound. However, these mega vessels can be counterproductive from an environmental point of view.

“Ports are often located where they have been since time immemorial,” explains Mikkelsen. Many harbors in Europe are on heritage sites, sometimes even right in the middle of medieval cities. Within such locations, there are extremely limited opportunities to expand.

Dredging is the most obvious solution to allow larger ships that sit lower in the water to dock. The disturbance this creates on the seabed though has a huge negative impact on marine life.

“This environmental issue is further exacerbated because all ships carry sacrificial anodes,” says Mikkelsen. These are metal bars placed on the hulls of ships that, through the principle of electrolysis, corrode instead of a ship’s hull.

“In the old days, these bars were typically made of lead but nowadays it’s usually aluminum, or a compound, but nonetheless it’s metals,” continues Mikkelsen. “As the anodes corrode, metal particles end up in the silt at the bottom of the waterways. When you start digging in the silt, these particles well up in the water column and can end up in marine life.”

To avoid dredging, maneuvering, docking and mooring needs to be as effective as possible. Moving within the confined areas of a port requires accurate and precise measurements to determine how low a ship can be before it hits the seabed. This is where Trelleborg’s advanced solutions come into play, Mikkelsen says.

“One of the things that we as a technology partner and provider do is to innovate and find groundbreaking solutions that will allow larger ships into ports,” he says. This provides a triple win to ship and port operators, Mikkelsen explains.

Above:
Gatun Locks in the Panama Canal with ships on three levels.

"Firstly, the deeper a ship can be in the water column, the more cargo it can carry, lowering costs for ship owners. Secondly, carrying more cargo reduces the carbon emissions from the transport of goods, helping ship operators meet their sustainability targets. And thirdly, the technology to accept larger ships into a port makes the port more competitive because it can achieve more cargo throughput."

Maximizing throughput is paramount to port owners. Not only does it make the ports more economically viable, but it also makes them more sustainable. "The longer a ship waits outside and takes to maneuver into a harbor, the more fuel it burns," says Mikkelsen. "Cut down the time of those two things and you save fuel, making the docking process more sustainable."

The maneuvering, docking and mooring technology that Trelleborg provides to ports significantly shortens times to enter and dock at port. "Without our solutions, on average it would take maybe 30 minutes to moor a ship, but with them it takes just a few minutes," Mikkelsen says.

A pilot is responsible for moving a ship into a secure location and maneuvering, docking and mooring it. Pilots used to do this just using their eyes and their knowledge. Now, however, they can use Trelleborg's portable pilot as well. This navigation system can help pilots do their job more effectively.

"One pilot in the UK says he is a 20 percent better pilot with the assistance of

PHOTO: GETTY IMAGES

Navigating the Panama Canal

Tommy Mikkelsen, Managing Director for navigation and piloting at Trelleborg, is involved in the specification of Trelleborg's marine products to ports globally. "We are currently working on the Panama Canal," he says. Built over 100 years ago and expanded recently, it is still not big enough for today's container ships to go through easily.

"Together with the Panama Canal Authority we are working on a very special fender system that will allow larger ships through the locks. We're also fitting out all the largest ships that go through the canal with the precision SafePilot P3 technology that communicates with onshore services to ensure that vessels have centimeter-accurate navigation. The Panama Canal Authority has now mandated that all ships above a certain size need to carry this type of technology."

our maneuvering, docking and mooring technology," Mikkelsen says. "It saves a lot of fuel if a ship has the correct trajectory as it enters a port. Maneuvering burns fuel, and the fewer commands given by the pilot, the more efficient the journey will be. When pilots are using Trelleborg's equipment they give fewer commands because they have a prediction of where a ship will be five or 10 minutes ahead. They know that they are on the right track."

Not only does Trelleborg's technology speed maneuvering, docking and mooring up, it also makes the whole process safer.

"We lose lives every year due to snapped lines," says Mikkelsen. "Mooring a ship is a very dangerous job, people catch their hands and fingers. The robots that we've developed are hands-free, helping avoid accidents and increasing efficiency as well."

And what about the future of shipping?

"There are several big projects going on that look at the development of self-sailing ships," says Mikkelsen. "It's a nice idea and I definitely see this as part of our future, but it's at least 20 years down the road. With all the technologies available today, if we just focus on creating completely autonomous ships, then we are going to lose opportunities to improve what we do with the shipping fleet we have." ■

"The robots that we've developed are hands-free, helping avoid accidents and increasing efficiency."

Tommy Mikkelsen, Trelleborg

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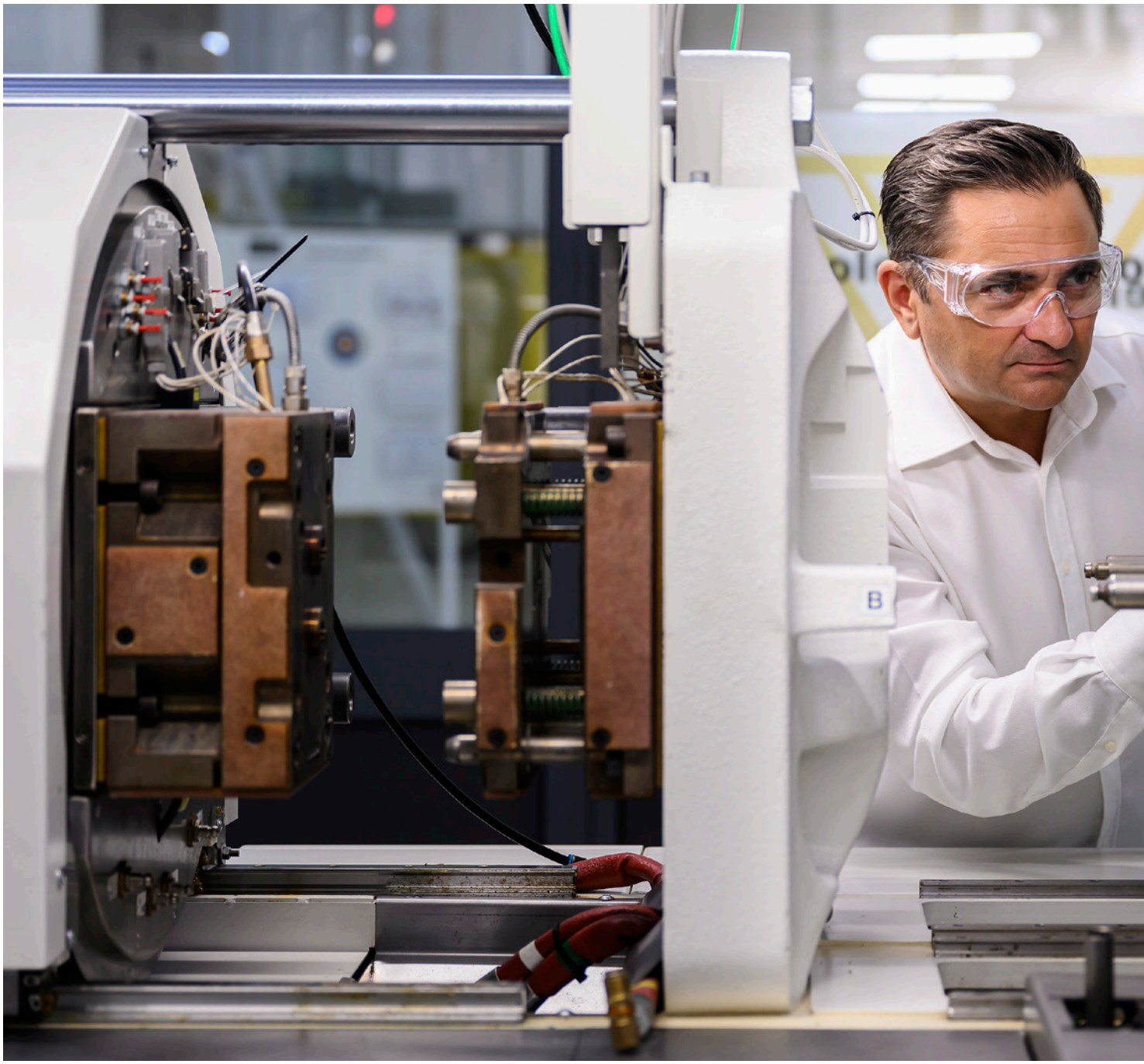


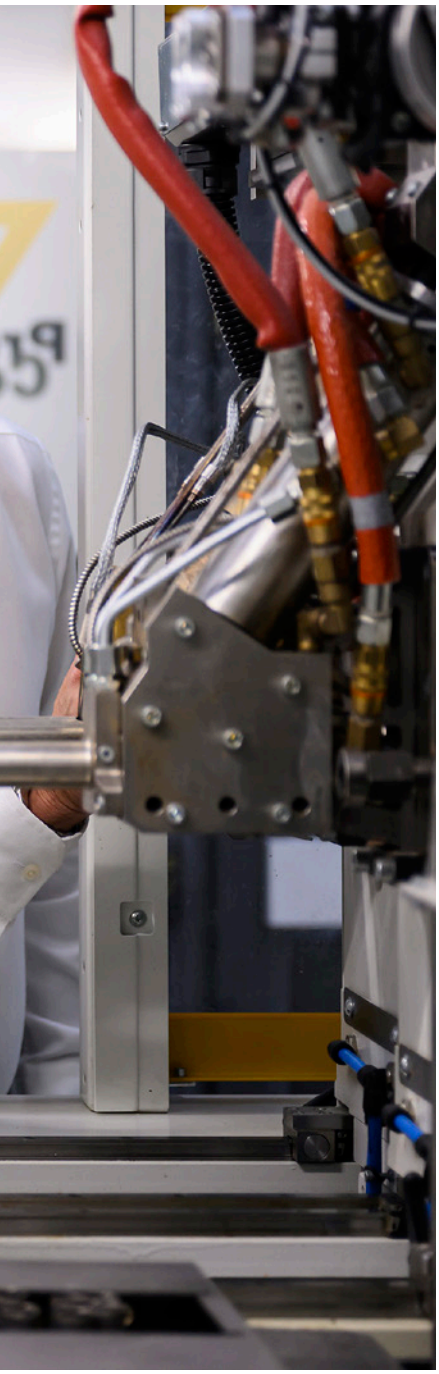
Gordon Micallef

Job:
Business Unit President, Operations, within Trelleborg's sealing solutions business.

Lives:
Born and based in Malta, having lived and worked in the US and Mexico.

Career:
Thirty-one years with Trelleborg in a variety of roles, including manufacturing operations, material development and purchasing. Holds a degree in chemistry and biology and a postgraduate in polymer sciences.

Free time:
Enjoys technical scuba diving, both wreck and cave, family vacation travel, and the occasional motorcycle tour around Europe when time permits.



Above:
Gordon Micallef, Trelleborg, sees many opportunities for AI, for example in process improvements.

Intelligent manufacturing

THERE IS A LOT OF BUZZ ABOUT ARTIFICIAL INTELLIGENCE, BOTH POSITIVE AND NEGATIVE. TRELLEBORG BELIEVES THAT FROM A MANUFACTURING POINT OF VIEW, AI OFFERS MANY BENEFITS, AND IT IS ALREADY BEGINNING TO TAKE ADVANTAGE OF THEM.

TEXT DONNA GUINIVAN **PHOTOS** SIVA JOEL GUELLER

It is difficult to pinpoint exactly when Trelleborg started using Artificial Intelligence (AI) to improve its processes and products.

"Our first steps in a tangible way for sealing solutions were probably taken in around 2017," says Gordon Micallef, Business Unit President within Trelleborg's sealing solutions business. "At that time, we began to look at the possibilities AI presented centrally, through information systems and process management, creating the Digital Transformation and IoT teams."

AI offers some immediate opportunities for process improvements, Micallef says, and he sees even more opportunities in the future. "For instance, we're well on the road to effectively using AI in automated inspection," he says.

Inspection machines using traditional detection technology look at the surface of a part and identify lighter or darker defects when compared to the general area being inspected.

"This technology has served us well over the years," says Micallef. "However, there are some sealing geometries and parts where traditional detection methods are not effective." Currently, Trelleborg has a project coming close to industrialization addressing these challenges.

"We take pictures of the parts produced and classify them as good or bad," he says. "There may be a variety of defect types and sizes, and the machine is taught which parts are correct and which are defective. The more you teach the machine, the better it becomes at recognizing the parts that do not meet a specification."

“We’re well on the road to effectively using AI in automated inspection.”

Gordon Micallef, Trelleborg

Another example of AI in action at Trelleborg is the Shim Wizard. Already in use, based on AI analysis, it recommends the best compound and properties to enhance the performance of automotive brake shims to design engineers. This results in a reduction of test time, leading to a faster time-to-market. In the pipeline are projects to improve rubber mixing and energy excellence.

“The common thread on all AI applications is data,” Micallef says. “There is no chance of being successful with AI without data – not a small amount, but a huge amount. For any AI application, we need a minimum of one year’s data for high-volume processes.

“It is vital that we are collecting process data that we will require for future AI projects now,” continues Micallef. “We work with the machine suppliers on data capture. For newer machines, this is inbuilt. With older machines, additional sensors provide information to external data capture devices. We have developed ActiviTEE, a digital software monitoring overall equipment effectiveness (OEE), to collect this information.”

AI also plays a role in efforts to increase the sustainability and circularity of manufacturing.

“Sensors in manufacturing equipment can gather data on the amount of energy used in a process and combine it with data from production monitoring,” says Micallef. “Comparing consumption with activity and cost, an energy usage profile will optimize the output of a manufacturing machine and minimize the energy used.”

In a circular economy, the aim is to use resources for as long as possible, Micallef says. AI can analyze product life-cycle data to suggest optimal times for refurbishment, recycling or repurposing, thus maximizing the utilization of production equipment.

“In the longer term,” he says, “AI could be used to estimate the carbon footprint

Above left:
Gordon Micallef inspects data at Trelleborg's factory in Malta.

Above right:
Micallef shows off some of Trelleborg's many sealing solutions.

Left:
AI detection machines can be trained to recognize defects.

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of components during manufacturing. By having a clear understanding of the environmental impact, we can potentially look for sustainable alternatives or improve processes to reduce emissions."

One of the negative perceptions about AI is the fear that it will take over people's jobs. Micallef admits this is a challenge. "Every technology presents opportunities and threats. Electricity meant that candlestick makers were out of work, but I think that we would all agree that we have a better quality of life with electricity than we did when we lit our homes with candles."

Rather than reducing the roles that people play in manufacturing, Micallef sees AI enhancing their jobs by allowing workers to avoid the mundane and repetitive and concentrate on more interesting and challenging tasks.

"With a technology as powerful as AI it is good to have boundaries," Micallef continues. "However, AI presents us with so many prospects for the future improvement and enhancement of our manufacturing processes that we must try and benefit from every opportunity the technology gives us." ■

"We found that through simple measures we could improve overall equipment effectiveness."
Dominik Martin, Trelleborg

Clever predictions

How will AI support manufacturing in the future? Dominik Martin, Manager Artificial Intelligence and Data Science at Trelleborg, shares his thoughts:

"One thing on the horizon in the next two to three years is predictive quality. For this, we're looking to combine real-time monitoring of manufacturing processes with statistical control and AI-based optimization tools. This will improve process stability and quality to reduce scrap, making production more efficient and effective.

"We're working with our customers on condition monitoring of our components in their products, but there is also the opportunity to perform condition monitoring on our own production equipment. We found that through simple measures we could improve overall equipment effectiveness.

"Potentially if we capture more data on temperatures, pressures, energy consumption of ovens or CNC machines, for instance, AI will give us a better understanding of underlying processes to create a fingerprint for each process. This will allow predictive failure and maintenance of machines."


FIGHTING THE FLAMES
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2
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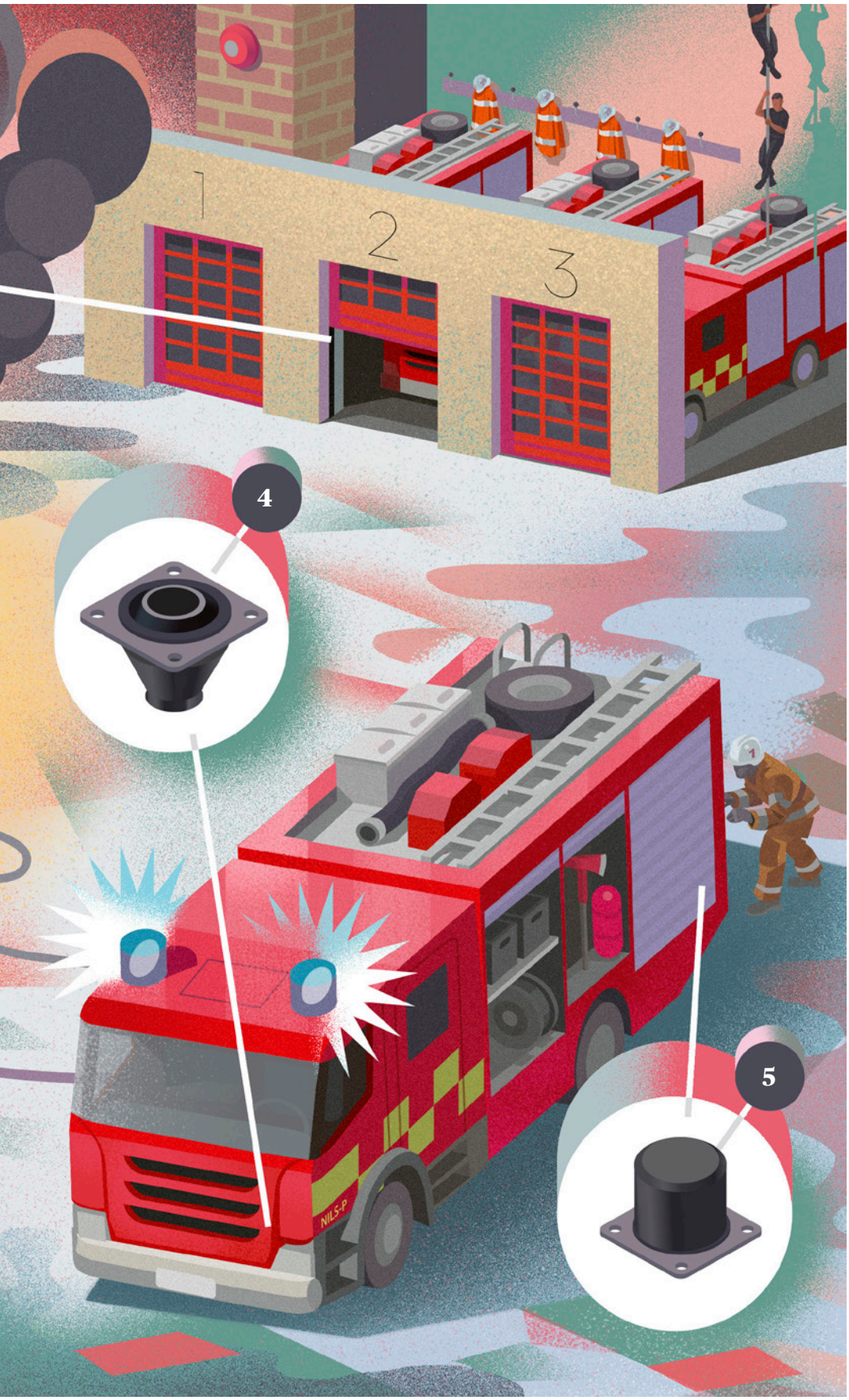


TEXT JAN SKLUCKI
ILLUSTRATION
NILS-PETTER EKWALL

What is essential?

When lives are at stake, time is of the essence. To support the heroic work of firefighters, Trelleborg provides a range of solutions that make the task of preventing loss of life and property safer and easier.

1. Sealing success

First responders quickly inflate Mini-leak Sealing Bags to secure pipes or containers, preventing fluids from escaping and causing further harm.

2. A quick escape

Reliable operation of garage doors can mean the difference between life and death. Trelleborg provides seals for swift and smooth opening to save valuable seconds.

3. Heavy lifting

Lifting bags inflate with air to raise immense weights, such as vehicles and debris – enabling recovery teams to free people trapped by accidents and disasters.

4. Rapid response

Firefighting vehicles must quickly decouple from water tanks. Trelleborg's Cone Bearings allow for safe and reliable quick release.

5. Damping down

Heavy engines carry the weight of people, water and equipment for disaster response. Antivibration solutions reduce maintenance requirements and improve comfort.

PHOTO: GETTY IMAGES

Powerful hoses are essential to fight fires.

Firehose facts

Large firehoses are more than six centimeters in diameter and can deliver more than 2,250 liters of water a minute. That would fill an Olympic-sized swimming pool in around 18 hours. Fire engines hold between 1,000 and 5,000 liters of water, providing a maximum of two minutes' use with one of these hoses from the engine's supply!

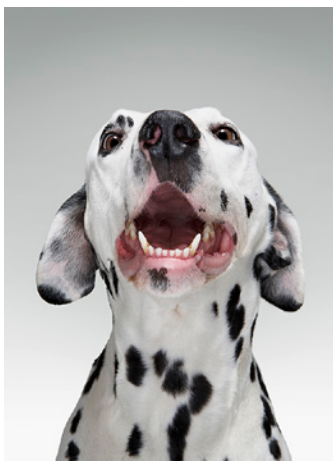


PHOTO: GETTY IMAGES

101 DALMATIANS

Dalmatians have been the unofficial mascot of firefighters in the US for centuries – but why? Speculation abounds, but several historians point to the dog's natural affinity for horses. During the 1700s, horses carried heavy firefighting equipment, and Dalmatians were employed to protect carriages and their occupants from bandits, making them a logical choice to guard expensive work-horses and clear crowded streets.

JAWS OF LIFE

First used in 1963 to free race car drivers from their vehicles after crashes, hydraulic rescue tools known as the "jaws of life" can cut, spread and ram wreckage to release trapped occupants. Saws were previously used as a rescue aid to cut through a car's chassis but were too slow. These new tools exert more than 70 MPa of pressure instantaneously.

PHOTO: ALAMY

27.08

seconds is the Guinness World Record set by Nicolas Fox and Michael Gerber of Germany to put on their firefighting outfits. The equipment can weigh up to 35 kilograms and consists of a helmet, coat and oxygen tank, but it may include much more depending on the emergency.

PHOTO: GETTY IMAGES

BEARDED WONDERS

At the start of the 20th century, firefighters were often required to grow full beards. They would soak them in water and place them in their mouths to block larger smoke particulates. At the end of the day, they would drink large amounts of steam beer, thought to cleanse their lungs. The earliest respirator was invented in 1825, featuring a long hose to breathe cooler and cleaner air from near the ground.

NEWS

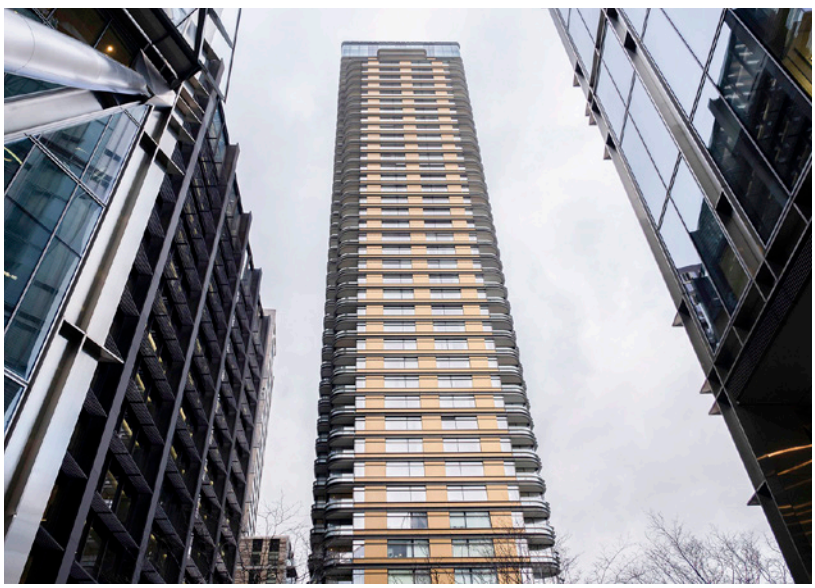


PHOTO: ALAMY

Principal Tower in London.

Only good vibes

One of London's iconic new apartment buildings benefits from Trelleborg's advanced vibration isolation technology.

The 50-story Principal Tower is situated near a tunnel that houses the Central Line of the London Underground in Hackney. It is also close to six rail lines that lead into Liverpool Street station, meaning it is at a constant risk of ground-borne vibrations.

Trelleborg worked with structural engineers to integrate an isolation system with multiple elastomeric bearing assemblies that can withstand extremely heavy loads.

PHOTO: GETTY IMAGES

Aerospace acquisition

Trelleborg has acquired an operation specializing in sealing solutions for aerospace and industrial applications. This bolt-on acquisition from the US-based 4M Company is part of Trelleborg's strategy to strengthen its positions in attractive industries.

Medical design tips

The webinars, tech talks and podcasts section on Trelleborg's website dedicated to the healthcare and medical industry has seen an update with a wealth of knowledge from its medical experts to help design components specifically for healthcare and medical applications.

PHOTO: TRELLEBORG

Going green in China

Trelleborg's facility in Qingdao, China, has been officially designated a "green factory" by the city's Bureau of Industry and Information Technology. It was the only company to receive this recognition in Qingdao's shipping infrastructure sector, reflecting the commitment of the site's team to achieve various ambitious sustainability initiatives.

PHOTO: TRELLEBORG

Right: Air traffic is growing, and so too is demand for energy-efficient aircraft equipment.

REACHING NEW HEIGHTS

AS THE LEADING SUPPLIER OF SEALS TO THE AEROSPACE INDUSTRY GLOBALLY, TRELLEBORG IS USING ITS EXPERTISE TO DEVELOP NEW MATERIALS AND COMPONENTS THAT MAKE AIRCRAFT SAFER, LIGHTER AND MORE ENERGY EFFICIENT.

TEXT CARI SIMMONS **PHOTO** GETTY IMAGES

Trelleborg's seals have enhanced the performance of planes since the golden age of the jet engine began in the early 1950s. The company was fully involved in the revolution of passenger transport heralded by the development of the Boeing 707 and continues to contribute to sealing technology on virtually all new aircraft platforms in the world.

One of the stalwarts behind Trelleborg's success is Torben Andersen, Director of the aerospace segment.

"In my 40 years in the field, I have seen continuous growth in aerospace, with people flying more and more," he says. "We have a five to eight percent growth year-on-year in air traffic, except for some dips in activity, such as after 9/11 and during the COVID-19 pandemic. Now the industry is recovering quickly back to pre-COVID levels."

Along with the rise in air travel, Andersen points out a need for airlines to replace older aircraft with new, more fuel-efficient planes to cut emissions and meet tougher environmental regulations.

"As an airline, you want to offer the most modern fleet among the competition," he says. "Newer planes burn around 25 percent less fuel, for example, and that means lower emissions." This reduction is partly due to Trelleborg's solutions.

"Our products help aerospace customers streamline their designs and transition from metal to composites for lighter, more energy-efficient aircraft and equipment," says Andersen. "A polymer part can save 30 percent in weight when compared to a metallic part. Every kilo lowers fuel costs by thousands of dollars over the lifetime of an aircraft."

"A polymer part can save 30 percent in weight when compared to a metallic part."

Torben Andersen, Trelleborg

> **"The more we know about a material the better for our customers, and material testing is key."**
>
> Amrita Bhogal, Trelleborg

With one-third of the operating cost for airlines going to fuel, this is a substantial saving, even if the weight reduction is just a few kilograms.

Trelleborg not only supplies products within the aerospace industry; it also supports it with services. For example, it provides training and help with installation at customer facilities, including recommending suitable installation tools. "This is important, as a seal will rarely fail within its recommended lifetime," Andersen says. "Most of the premature failures that happen are due to improper installation."

Specialty kits also help to ensure a correct assembly.

"The important thing is that the person assembling a component has exactly what they need at the workstation or on the assembly line," Andersen explains. "This makes it easier for them. All the seals within our kits come individually packed and marked with a barcode or RFID tag for scanning and traceability. This also ensures that the parts remain clean and dust- or sand-free for installation."

Perhaps the most essential service Trelleborg offers is its testing. The company has five full-scale testing facilities for aircraft and landing gear in China, Denmark, Germany, the UK and the US.

"We take on testing for customers to make sure our seals or materials will perform in a particular application," Andersen says. "For example, we can test the performance of a seal, the movements of a cylinder or the length of time a seal will work. We have tests that mimic the landing gear of aircraft, and we do seal qualification tests that have to work for 25,000 landings."

Amrita Bhogal is an application engineer at the Trelleborg aerospace hub in Europe. The company's expertise, ability to test physical properties of materials and evaluate the performance of seals give customers peace of mind, she says.

"We can, for example, do tests for

Below: Trelleborg products can be found throughout the main cabin of a plane.

A one-stop shop for interiors too

The next time you fly, look around you. Trelleborg products are everywhere in a plane's cabin, from overhead bins and light panels to window shutters, frames and even the toilet seats.

Trelleborg enhanced its aircraft interiors program starting in 2020.

"We learned valuable lessons that we reflected on and created processes to ensure success for the future," says Melanie Wunsch, Aerospace Application Engineer. "Since then, we have increased the new interiors product introduction from 30 parts a year to 250 for tooling transfers and injection molding."

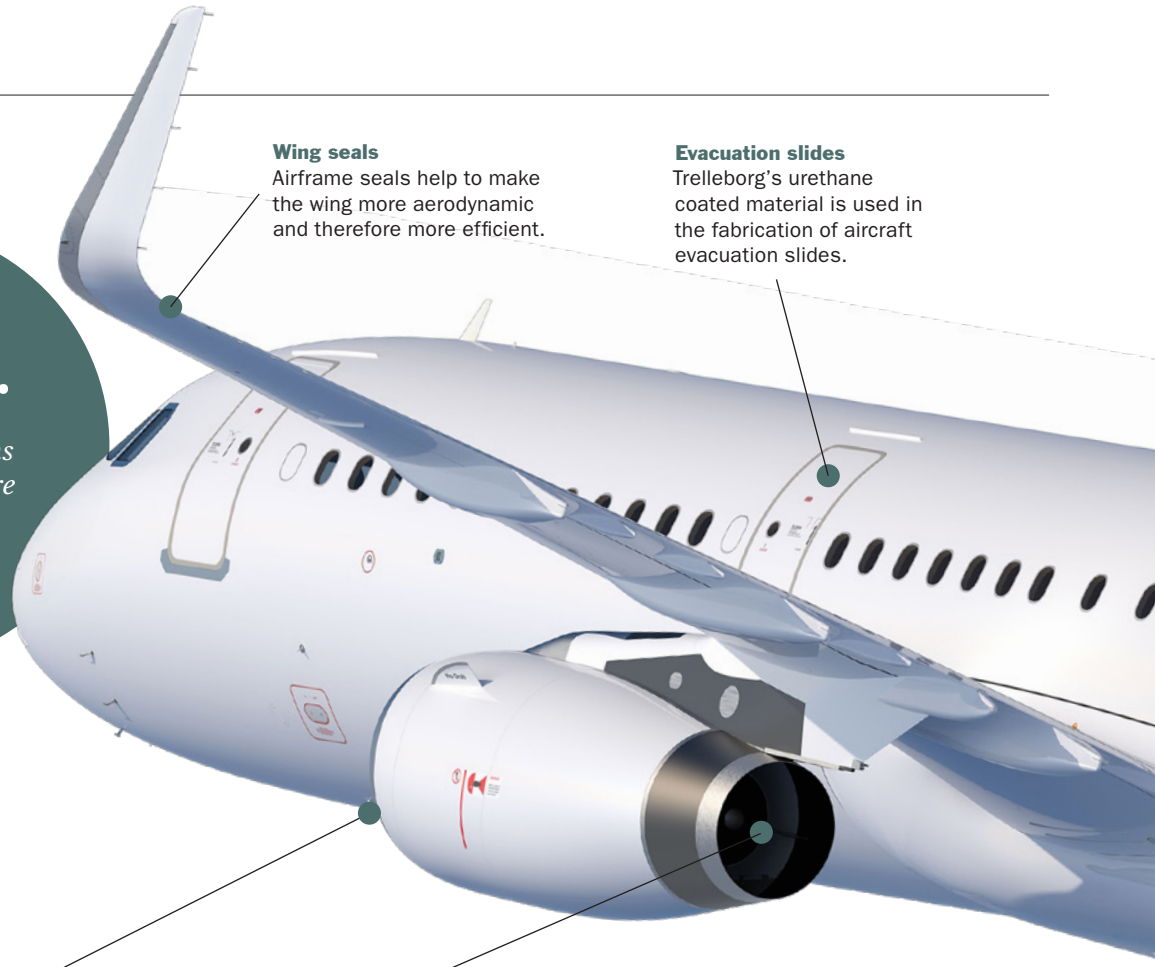
Some 60 new grades of polycarbonate, polyetherimide, and polyphenylsulfone, ranging in color from translucent to specific colors matched to customer requirements, are available.

"We have implemented a color-matching capability and have a photo spectrometer for the analysis on each color match in line with a customer's needs," says Wunsch.

Prior to introducing a new customer product, Trelleborg works hand in hand with the customer, providing resources such as engineering, quality control and project management.

In the air

Trelleborg's solutions are found everywhere in an aircraft.



Wing seals
Airframe seals help to make the wing more aerodynamic and therefore more efficient.

Evacuation slides
Trelleborg's urethane coated material is used in the fabrication of aircraft evacuation slides.

Landing gear seals
These boast a proven track record of more than 25,000 landings on large commercial aircraft.

Jet engine seals
One of the widest ranges of seals for use in aerospace engines, ranging from high temperature O-Rings to thermal shielding products.

PHOTO: GETTY IMAGES

PHOTO: TRELLEBORG

customers on materials and products to demonstrate physical properties and endurance," Bhogal explains. "This shows how effective our seals are in different environments."

Sustainability is a key factor for all industries today; it is particularly important for the future of the aerospace industry. The search for more sustainable fuels for aircraft is one area where testing is highly valued, for example, in hydrogen and sustainable aviation fuel (SAF) applications. "With newer types of fuel, testing must be done to ensure that materials are compatible to provide the best sealing solution, or we rule them out," Bhogal says.

Trelleborg shares its test results with customers. "The more we know about a material, the better for our customers, and material testing is key," she says. "Material testing and application conditions can influence the design of seals."

All Trelleborg products meet tough industry standards. Proper documentation is important to ensure traceability, and Andersen says this is critical for Trelleborg's customers. "We have a quality system with everything documented, from proof of airworthy parts to where the parts came from and how they were produced," he says. "We offer the assurance, security and safety that a smaller supplier may find difficult to provide."

As a major player, Trelleborg continues to expand and enhance its product range in the aerospace industry. It also offers a dual supply for every part through multiple manufacturing sites in different countries. "This ensures that there is no disruption for the customer should supply from a site unexpectedly be interrupted," says Andersen. "We operate with the same high quality in all of our manufacturing locations to ensure consistency for our customers." ■

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Alyssa-Amor Gibbons

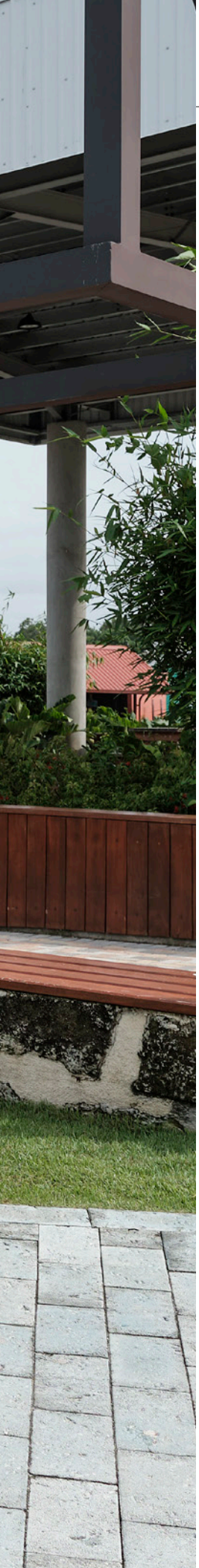
Lives: In Saint George, Barbados.

Occupation: Architectural designer.

Education: Master of engineering, MEng, Structural Engineering and Architecture (Dual Hons).

Works: At own design business and Spinnaker Group.

Other activities: Leads FutureCITY project, a smart city initiative.



Left: Alyssa-Amor Gibbons uses ancient techniques in her designs to withstand tropical storms and hurricane threats.

BUILDING ON PAST LESSONS

Storms, floods, landslides and heat waves – the challenge of climate change calls for buildings that can withstand a new reality. In Barbados, architectural designer Alyssa-Amor Gibbons is convinced that part of the solution can come from time-tested techniques.

TEXT DANIEL DASEY **PHOTOS** STEPHAN TYREL

We live in a world where extreme weather events are becoming more common. According to the World Meteorological Society, the number of natural disasters due to extreme weather has grown fivefold over the past 50 years, with climate change as the leading driver. To help manage this evolving threat, the world needs dwellings and buildings that can cope with severe storms, flooding, landslides and extreme heat. Many architects are looking to modern materials and techniques to provide solutions, while others are taking lessons from architecture's past – with promising results.

In the Caribbean country of Barbados, architectural designer Alyssa-Amor Gibbons is a strong advocate for borrowing from endemic (traditional, local) built forms to address climate change challenges. With her home country subject to increasingly wild tropical storms and hurricane threats, she says the old ways of managing high winds and driven rain have never been more relevant.

"If you look at many of the designs from the past, there's this built-in ingenuity," she says. "People built homes that, for security's sake, could be packed up and moved at a moment's notice. But at the same time, they were resilient enough to withstand extremely bad weather. So, referencing indigenous, or endemic, designs just makes sense."

Gibbons says some examples of traditional approaches that are relevant in the era of extreme weather are shutters that reduce the pressure on building facades by allowing air to pass through buildings, and roof shapes that reduce

PHOTO: ALYSSA-AMOR GIBBON

Left:
Houses with jalousies designed by Alyssa-Amor Gibbons. In Barbados, integrating practical solutions like jalousie windows with aesthetic designs can help a home withstand harsh conditions.

> **"These designs will become relevant in other countries as they experience similar extreme conditions."**
>
> Alyssa-Amor Gibbons

the surface area exposed to high winds. These traditional ways of dealing with moisture and dispersing extreme heat also have modern applications.

Gibbons recently shared her enthusiasm for this approach in a TED Talk, attracting interest not only from people in tropical climates but also from those in more temperate areas where violent storms are increasingly becoming the norm.

"As time goes on, I think the precedent that we're setting here with these designs will become relevant in other countries as they experience similar extreme conditions," she says.

Gibbons, who runs her own design practice and also works as a sustainability adviser, says her childhood growing up in Barbados shaped her approach to design. Her home country lies in Hurricane Alley, a stretch of warm ocean heavily prone to hurricanes between northern Africa and Central America's east coast.

"As a child, I knew that summer meant both school break and hurricane season," she says. "You would go out to the hardware store, buy plywood and duct tape, and then duct tape up your windows. You get your batteries; you make sure you have a kerosene lamp in case the electricity goes off. And you hear and feel the house reverberating as the hurricane systems pass. For me at least, it was terrifying."

When she graduated with a master's degree in engineering, Gibbons wanted to honor the strong survival skills of the early inhabitants of Barbados and began studying traditional architectural features with potential modern applications.

An example of one of these features from the past relevant in this era of climate change is the jalousie window, a wooden shutter with horizontal slats sloping down to the exterior. "One purpose of the shutter was to keep peering eyes from seeing into your home," Gibbons says in her TED talk. "But the shutters also allowed the wind to filter through while keeping rain out. The apertures would permit you to open all the slats on the windows and doors to let a hurricane pass through, channeling that wind through the building's interior instead of building up destructive pressure on the facade."

Incorporating features modeled on jalousie windows in a modern house can create better resilience to violent storms while also helping to control internal temperatures and occupant comfort.

"If you look at things like the shape of a roof, a lot of older houses had high-pitched gable roofs, which deflected wind up and over them, helping them to survive strong winds. They also had deep verandas to keep the sun off the porch and to control how the wind moves around the space, creating a breeze."

Gibbons says each project she

PHOTO: ALYSSA-AMOR GIBBONS

Below: The traditional jalousie window lets the strong winds pass through instead of building intense pressure on the facade.

Extreme weather the new norm

The nature of weather on our planet is rapidly evolving as global temperatures continue to rise. At the time of writing, 2023 was expected to be the hottest year globally since records began, with July 2023 the hottest month on record. These higher temperatures are, in turn, driving extreme weather events, such as more intense heat waves and longer and broader wildfires. As ocean temperatures rise, warmer water is fueling more intense hurricanes, while droughts are becoming more persistent in some areas. The buildings that architects and designers create today need to be able to address these changes as well as others, including higher rainfall and rising sea levels.

works on is unique. She examines the site, looks at traditional and modern solutions and materials, and discusses options with the client.

Some of Gibbon's past projects include works on post-disaster redevelopment of residential and commercial properties in the Caribbean, such as Secret Bay, Dominica, as well as a social innovation mixed-used project at TEN Habitat in Barbados. In her latest prospective project – the adaptive reuse of an iconic building in the capital city of Bridgetown, Barbados.

While her ideas on endemic design have generally been well received, she says there remains a stubborn belief in some sectors that buildings in Barbados should function like those in Stockholm in Sweden or New York in the US.

"Not everyone lives in the same climate," she says. "A lot of successful architecture from parts of the world other than Barbados has an emphasis on keeping the building cold and keeping moisture out, because that's important in those climates. But trying to do that in a tropical climate is unnecessary and often doesn't work. We don't have to close nature out in the way that other places might need to, and we need to design accordingly."

Gibbons encourages building designers across the planet to take a close look at traditional designs when solving design challenges. "Just because something is usually done a particular way doesn't mean it's the best way. There's often endemic design that has survived decades, maybe even centuries. That should be your starting point." ■

Above: Alyssa-Amor Gibbons at the Builders of Barbados Wall in the Golden Square Freedom Park in Bridgetown, which was inaugurated in 2021.

Endemic design

Endemic design refers to a design approach or philosophy considering the local or regional context, culture, and environment when creating products, buildings, or solutions. It aims to create designs that are uniquely suited to a specific geographic location or cultural setting. The term "endemic" typically refers to something native or specific to a particular area, so endemic design seeks to incorporate and celebrate the local identity, materials, and traditions.


OFFICO

PUMP AND ROLL

A NEW AIRPORT RESCUE FIREFIGHTING VEHICLE FROM NAFFCO CAN SPRAY WATER OR FOAM AT A RATE OF 10,000 LITERS PER MINUTE WHILE APPROACHING A MOVING PLANE. SPECIALLY DESIGNED ANTI-VIBRATION MOUNTS FROM TRELLEBORG ENSURE THAT THE VEHICLE OPERATES SAFELY AND SMOOTHLY IN THE MOST DIFFICULT OF ENVIRONMENTS.

TEXT PATRICK GOWER **PHOTOS** JAMES NAVARRO

Left:
The new ARFF vehicle from NAFFCO is built to meet the requirements of fast intervention in case of emergency.

Firefighting at airports presents unique challenges. Jet fuel is highly flammable, and the weather can be unpredictable. Teams must respond rapidly to outbreaks of fire on large aircraft using methods that require specialized equipment and tactics.

The ARFF (airport rescue firefighting) vehicle from Dubai-based manufacturer NAFFCO succeeds in such conditions. While typical fire trucks must be stationary to pump water, the ARFF can deliver water or foam at a rate of 10,000 liters per minute while approaching a moving target. The feature is vital in protecting passengers when a plane is conducting an emergency landing with a fire on board.

"The pump and roll aspect is what makes the vehicle truly unique," says Ali Al-Khatib, Managing Director at NAFFCO. "The design process required collaboration from engineers, fire safety experts and manufacturers,

“The less the vehicle vibrates, the more effective the crew can be.”

Ali Al-Khatib, NAFFCO

so our team has expertise in everything from firefighting tactics and fire suppression systems to vehicle engineering and hydraulics.”

NAFFCO produces 4x4, 6x6 and 8x8 ARFF vehicles, ranging from 500 to 900 horsepower. Equipped with foam and water turrets operated remotely, some vehicles even have thermal imaging cameras to locate hotspots or victims in low-visibility conditions.

The new ARFF vehicles feature Trelleborg anti-vibration mounts specially designed to reduce the transmission of vibration and shock to the vehicle’s chassis and crew. The mounts are durable, reliable and easy to maintain, and they ensure that the vehicle operates smoothly in the most challenging environments.

“Tackling a fire while rolling can produce a huge amount of vibration, which threatens the safety of the crew and the integrity of the sensitive equipment inside the vehicle,” Al-Khatib says. “The less the vehicle vibrates, the more effective the crew can be.”

NAFFCO opted to work with Trelleborg to develop the vehicle because of its reputation for “producing high-quality products that effectively reduce vibration and shocks,” he adds. “NAFFCO’s products are all about quality, and the same goes for Trelleborg, which is why the partnership worked.”

NAFFCO has sold “hundreds” of ARFFs all over the world, Al-Khatib says. Travelers are likely to glimpse one at high-traffic airports that are more likely to have dedicated ARFF teams. The company plans to manufacture more than 200 ARFFs in 2024 at its facility in Dubai.

“Providing high-quality, reliable products to people doing vital work in hazardous environments lies at the core of our purpose as a company,” says Jonathan Wills, who heads up marketing for Trelleborg’s anti-vibration solutions. “By reducing vibration and shock transmission to the vehicle’s chassis and cab, we are ensuring the safety and comfort of the firefighters who operate it whilst protecting sensitive onboard equipment.” ■

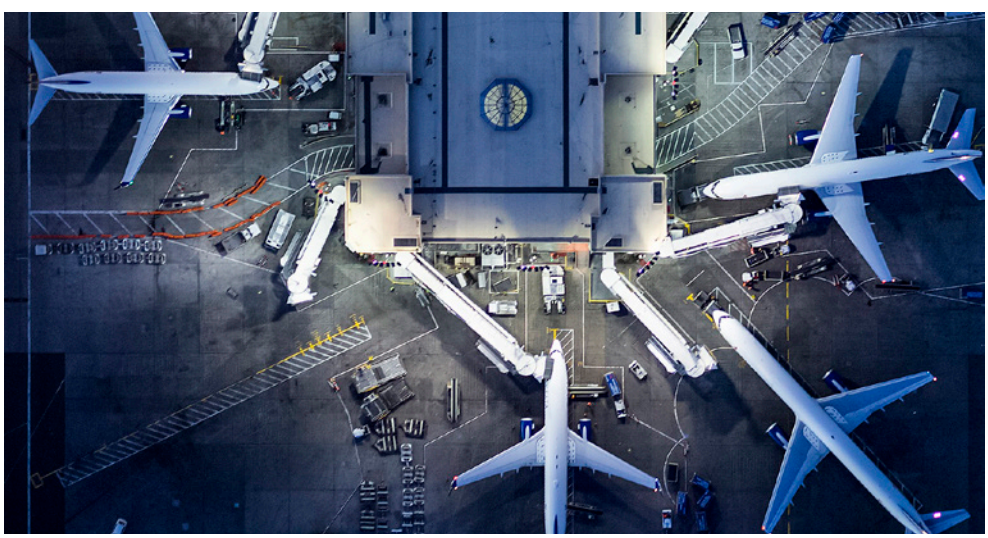


PHOTO: GETTY IMAGES

Left: Firefighting at airports is a difficult operation.

Anti-vibration mounts from Trelleborg ensure that the ARFF vehicle operates smoothly.

ABOUT NAFFCO

Dubai-based NAFFCO is among the world’s leading producers and suppliers of what it calls “life safety” solutions. The group develops products ranging from fire protection systems and fire alarms to custom-made vehicles, such as fire trucks, ambulances, mobile hospitals and ARFF. The group employs 15,000 people, including 2,000 engineers.

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NEWS

PHOTO: TRELLEBORG

Carsten Kirchholtes, Daimler Truck North America, and Jill St. John, Sales Engineer, Trelleborg.

Daimler honors Trelleborg

Trelleborg received the distinguished Masters of Quality award from Daimler Truck North America, a "best of the best" honor reserved for component and service suppliers who exceed outlined expectations.

"This is a very big accomplishment within DTNA. Out of all our suppliers, only about 20 receive the Masters of Quality Award annually, and we are honored by their dedication and partnership," says Carsten Kirchholtes, General Manager of Procurement and Supply Chain Management, Daimler Truck North America.

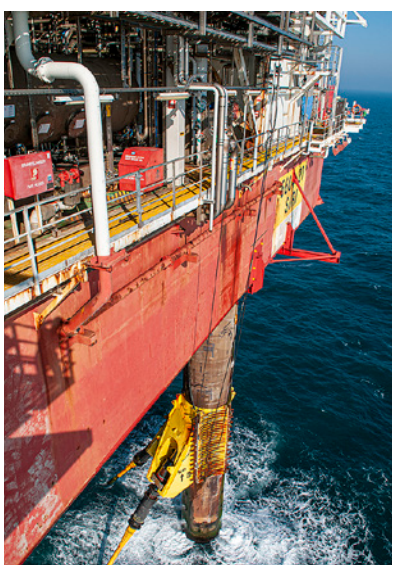


PHOTO: PROJECT GREENSAND

The Greensand project stores CO_2 in the North Sea.

CO_2 capture success

Central to the success of the groundbreaking Greensand CO_2 capture project in the Danish sector of the North Sea, Trelleborg's high-quality hoses transported greenhouse gas captured from the atmosphere to a safe and efficient storage site in the subsoil of the seabed.

Global capabilities with local presence

PHOTO: TRELLEBORG

With the aim of providing local resources, Trelleborg expands its facilities and actively seeks acquisitions to extend its global capabilities as part of a strategy to strengthen its positions in attractive industries.

To this end, Trelleborg acquired MNE Group, which consists of the companies Materials Nano Engineering and Materials Nano Solution, a leading South Korean manufacturer of precision seals for semiconductor production equipment.

"Through MNE Group, we gain established customer contacts with some of the world's key semiconductor equipment manufacturers. With South Korea as a base, we plan to further grow our presence in the semiconductor market across Asia," says Peter Hahn, Business Area President for Trelleborg Sealing Solutions.

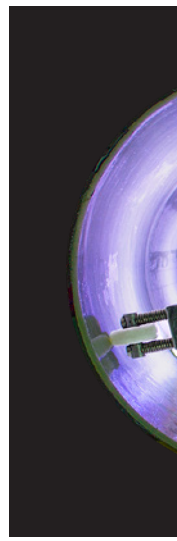
In addition, Trelleborg is stepping up its presence in the key Asian market of Vietnam with the opening of two manufacturing facilities there. Late 2023, saw the inauguration of a brand-new production site for Trelleborg's sealing solutions, significantly increasing the production capacity for engineered seals in the region. The other facility will focus on manufacturing for marine construction and infrastructure projects, as well as fenders.

Inauguration ceremony at the new Trelleborg location in Vietnam.

Underground rehab

Trelleborg is a leading exponent of rehabilitation solutions for pipe and sewer infrastructure. It has recently added to that expertise with several new technologies in its portfolio.

TEXT JOHANNES WENDLAND
PHOTOS TRELLEBORG



The last few warm summers have made it obvious; water is a scarce resource that should not be wasted through leakage.

Aging water infrastructure, some dating back to the early nineteenth century, means pipes break and connections become leaky, causing valuable drinking water to soak into the ground. The estimated figure for global water loss is 30 percent; that is equal to one in every three glasses of water seeping into the earth.

Pipe and sewer repair is critical to preventing water loss. In the past, doing this meant complex construction work with roads, domestic connections, and structures needing to be torn apart and then put back together again. Today, trenchless pipe rehabilitation is becoming the more typical approach. It is quicker, more cost-effective and less disruptive.

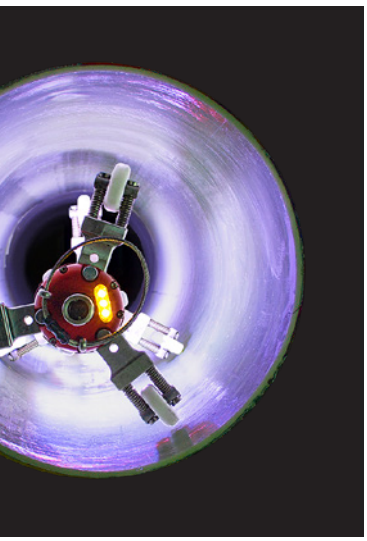
Hoses inserted into existing pipes and cured in place facilitate a repair. Using this method and covering the inside of a pipe with a continuous surface, a new pipe is created within the old one.

Innovative Sewer Technologies, or I.S.T., has been a leading exponent of this technique since it was founded in 1998. The company, based in Bochum, Germany, has become one of the most successful full-service providers for pipe and sewer rehabilitation, and was purchased by Trelleborg in December 2022.

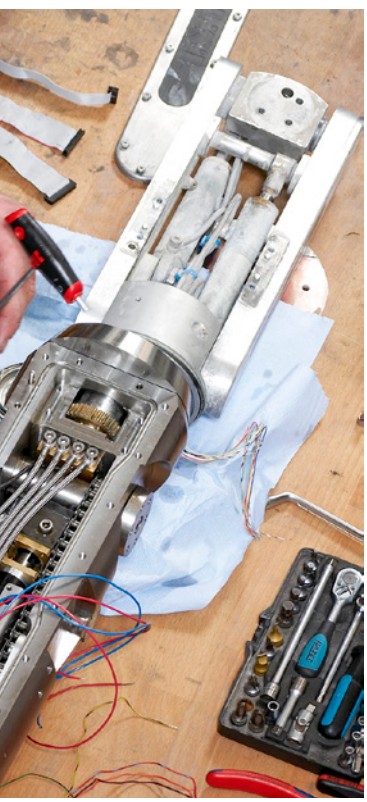
Jörg Vogt, the founder of I.S.T and now Product Group Manager, responsible for the site in Bochum, explains: "We not only offer the consumables needed for sewer rehabilitation but also the equipment and machines required to perform the repair operation. There are competitors in the fields of milling or robotics or consumables, but there is no other company that can cover all three areas."

Vogt, a qualified engineer in chemical and glass technology, initially sold only the materials required for trenchless pipe rehabilitation – hose liners made from various materials and impregnated with synthetic resins.

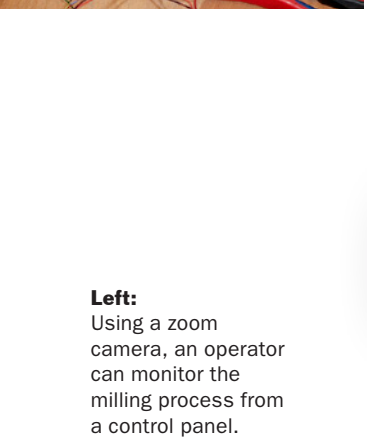
"In our early years, steam and



Left:
With UV curing of inliners you can follow and control the rehabilitation process using cameras.



Left:
Powercutter repair.



Left:
Using a zoom camera, an operator can monitor the milling process from a control panel.

"We not only offer the consumables needed for sewer rehabilitation but also the equipment and machines required to perform the repair operation."

Jörg Vogt, Trelleborg

hot water were used for the curing process. The disadvantage was that you couldn't follow up the curing process," Vogt explains. "So, we turned to UV curing after a few years. The advantage is that you evenly cure the inliner with UV light and at the same time can follow and control the process using cameras."

Trelleborg realized the importance of UV curing, and the I.S.T acquisition was therefore a strategic addition that strengthened Trelleborg's position in the pipe repair market.

The Bochum facility manufactures light sources for a wide range of pipe diameters.

Luminaires with up to 1,000 watts hang together in chains in the middle of wheel constructions that pull the UV light chains through inliners at a constant speed with the help of winches. Precisely measured wheel sets fit different pipe diameters. For lateral house connections, the company offers LED light curing with just one curing head in sizes down to seven centimeters in diameter.

There is also a range of milling robots to prevent the clogging of pipes and ducts. At the front end of a cutter there is a milling head powered by compressed air or electricity, driven through pipes at high speed. A zoom camera supports the operator who monitors and controls the milling process from a control panel.

There are around 80 people working at Trelleborg's facility in Bochum. Inliners are rolled up, folded and sewn on two fully automatic manufacturing lines while technicians assemble robots and UV systems. In a separate area, application engineers experiment with new formulations to make inliners even more flexible and to further reduce curing times. Consumables stored on high shelves make the concept of a one-stop-shop for sewer rehabilitation a reality.

"We have a highly qualified and trained staff, high-quality materials and the best possible equipment," says Vogt. ■

About Trelleborg's Bochum facility

- Full-service provider for consumables, milling robots and UV systems for trenchless pipe and sewer rehabilitation
- Target groups: pipe rehabilitation and civil engineering companies
- Around 80 employees

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Protecting the essential