T-TIME

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A magazine from Trelleborg Group. Solutions that seal, damp and protect critical applications.

A close-up on rubber

Trelleborg leads the way toward new standards

Page 6

"Every fact we learn in life has an expiration date"

Samuel Arbesman

MOSE stops **the flooding**
Hidden steel barriers protect Venice from a deluge

A gentle touch protects the soil
Agricultural tires help reduce carbon footprint

TARGETED APPS SAVE TIME | AGILE FLOATOVER SOLUTIONS

IN EACH ISSUE

Separating the wheat from the chaff

WHAT DISTINGUISHES GOOD-QUALITY rubber from poor-quality rubber? Assessing the quality of rubber is tricky because of a lack of visual clues, manufacturers' unique formulas and an aggressive recycling process that may degrade the material. Trelleborg has many skilled, passionate people who would like to see rubber as an engineered material like steel, with clearly defined specifications. To help customers separate the wheat from the chaff, we have developed a test to analyze the consistency and chemical composition of rubber used in fenders in the marine industry. On page 6, you can read about our method.

Enjoy your reading!

Peter Nilsson
President and CEO

TRELLEBORG

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Venice, with its ornate palaces along miles of gondola-traveled canals, has drawn visitors for centuries. Threatened by rising tides, the historic city has embarked on an engineering project to preserve its treasures for future generations.

PROTECTING VENICE

TEXT ULF WIMAN
PHOTOS GETTY IMAGES AND TRELLEBORG

The term MOSE, recalling Moses and the parting of the Red Sea, is a particularly apt name for the project aimed at saving Venice and the Venetian Lagoon from the threat of ever-high tides. Concerns that the flooding is getting worse because of global warming mean that the massive infrastructure project is one of the most important in the city's history.

The MOSE, constructed by the Ministero delle Infrastrutture e dei Trasporti – Magistrato alle Acque di Venezia (Ministry of Infrastructure and Transport – Venice Water Authority) through the Consorzio Venezia Nuova, is part of a major systemic program of measures combining physical defense with restoration of the morphological equilibrium of the entire lagoon ecosystem. The final and most important element in the planned intervention to safeguard the lagoon area, the MOSE construction, is now about 80 percent complete. It was preceded by a work program unequaled anywhere in the world for the size of the area involved, the nature of the problems tackled and the scale and characteristics of the measures implemented.

Scheduled to be completed in 2016 at an estimated cost of 5.5 billion EUR, the MOSE project requires 78 mobile barriers to be installed at the Lido, Malamocco and Chioggia inlets, the gaps through which the tide enters the lagoon and that separate it from the Adriatic.

The barriers consist of steel gates installed end-to-end and are used only when there is the danger of flooding. The gates are normally completely invisible, resting in special housings in the bed of the lagoon inlets. When high water is forecast, they are temporarily raised to isolate the lagoon from the Adriatic Sea. When the tide goes down, the gates are returned to their housing in the seabed. Trelleborg has been very involved in the MOSE project with contracts to supply the project with tailor-made sealing solutions and multiple fender systems.

Basilica San Marco, Mark´s Square, Venice, Italy

Apprehension that the flooding of the Venetian Lagoon will grow worse was the origin of one of the most important infrastructure projects in Venice's history.

TRELLEBORG worked closely with the consultant engineer, Technital, during the design phase as well as with one of the project's main contractors, Clodia SpA. "For such a large-scale infrastructure project, it was vital that we source a reliable solution that would stand the test of time," says Diego Zandolin from Clodia. "Trelleborg promised a hassle-free installation process and proven functionality. Its fender systems and bespoke sealing systems provide an ideal solution. "Trelleborg supplied its state-of-the-art Super Cone and Arch fenders after overcoming the challenge of

supplying a large quantity of fenders in a particularly short turnaround time," Zandolin explains. "It also provided the sealing system solutions while meeting some extremely demanding guidelines. Although we knew the Trelleborg system was already proven globally, Trelleborg was able to tailor it to deliver a custom-solution that would precisely meet the project's needs. The ease of installation for the system was also a major factor in choosing Trelleborg."

Zandolin explains what his company was looking for: "We needed multiple made-to-order sealing system solutions, and Trelleborg was able to meet our requirements with a combination of highly resilient natural rubber Seismic Gina gaskets, a molded and handmade seal manufactured to the highest tolerances, as well as Omega seals."

The closed Gina gasket will be attached to the barriers and act as a dynamic seal, ensuring watertight protection, while the Omega seal will act as a secondary seal between the sectional elements of the mobile barriers.

RICHARD HEPWORTH, President of Trelleborg's marine operation within Trelleborg Offshore & Construction, comments: "We're delighted we could develop effective solutions for such a significant project, one that will undoubtedly help safeguard the future of Venice." He points to Trelleborg's industry-leading range of products, technical expertise and end-to-end support as key factors in the project's success. ■

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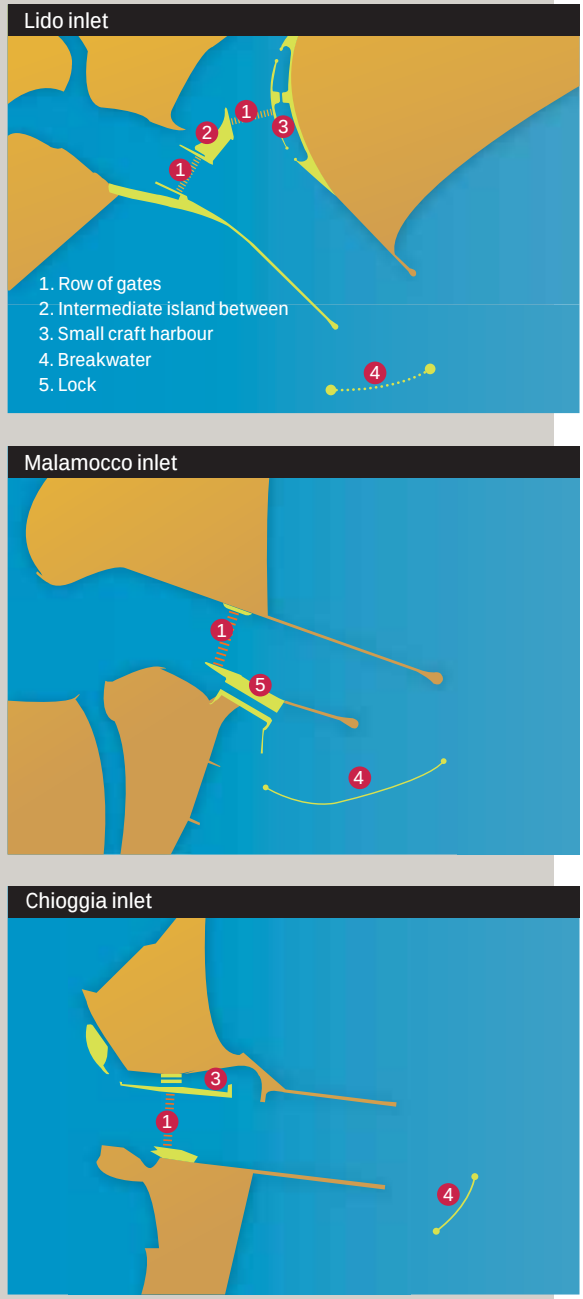

THE SYSTEM

The MOSE system is being constructed in the Venetian Lagoon inlets, the spaces between the barrier island through which the tides enter and exit the lagoon. There are three lagoon inlets, Lido, Malamocco and Chioggia (800 m, 400 m and 380 m wide, respectively). The inlets are delimited by long jetties built between 1800 and 1900. These were consolidated in the 1990s and thus serve as support to the high water defence system.

Above: The configurations of the lagoon inlets with the defence structures

TAKING A HARD LOOK AT RUBBER

Assessing the quality of any given sample of rubber is notoriously difficult, thanks to commercial secrecy, crude recycling processes and a lack of reliable visual clues. To help address quality concerns in the marine industry, Trelleborg has developed a test for rubber fenders used in dock protection systems.

TEXT ELAINE MCCLARENCE **ILLUSTRATION** MARIE LAURE CRUSCHI

WHEN CHARLES GOODYEAR patented the vulcanization process in 1844, he transformed soft rubber into a hard and useful material. Today, industrial rubber is so ubiquitous that its many roles go unnoticed, says Mishra Kumar, Global Technical and Market Support Manager at Trelleborg's marine operations within Trelleborg Offshore & Construction. "Rubber has found its application in almost everything from the iPhone to the Airbus A380. Its uses fall into three broad areas of use: to seal, damp and protect."

Like its many and varied applications, rubber compounds come in an array of variations, with each manufacturer having its own unique formulations. Besides using natural rubber as the starting raw material, synthetic forms derived from petrochemical products are also used. "Each raw rubber has its own inherent advantages or disadvantages and is application-dependent," Kumar says. To provide different functions and to be endowed with specific properties other chemicals are added, such as fillers that can reinforce or bulk the material, aging protectors and softeners that regulate material hardness. Then there is the mixing process itself, the mixing cycle, the timing of each part of the process and the temperatures used for mixing and curing – all of which make a contribution to the final makeup of the rubber.

As a step toward answering the question of rubber quality in the marine industry, where a major application is for fenders that are used as part of dock protection systems, Trelleborg has developed a specific test regime for rubber fenders.

Designing a rubber compound is often considered to be a black art. Many manufacturers jealously guard their formulations, but Kumar believes that more openness about the composition of rubber is required, that there is a need to set technical standards in the industry and to work toward the development of better-engineered materials that can be assessed against those standards. He wants rubber to be seen as an engineered material selected for its performance, characteristics and long life rather than regarded as a commodity and bought on price alone. One way to transform customer perceptions is to develop methods to better assess rubber quality in a consistent way.

This is because in some major industrial applications – the marine industry, for example – the influx of producers and suppliers has led to poor-quality rubber based on recycled material. Kumar explains that current methods of recycling, while laudable in principle, are not environmentally sound. "The recycling process is aggressive, very intense and highly polluting," he warns. Furthermore, the rubber's original properties are not restored, resulting in an inferior material. "The unique properties of rubber come from its long chain molecules, but recycling shortens the molecular chains, thus degrading the material," he says. This has a consequent effect on component performance and operating life.

Kumar points out the difficulty customers experience in trying to assess rubber quality. After all, most industrial rubber contains carbon black, an additive that helps reinforce or strengthen the material. It also gives rubber its black color, so the overall appearance of a good-quality or an inferior material cannot be gauged by visual inspection alone. What makes good rubber is an extremely difficult question, as rubber quality has been notoriously difficult to define. Kumar offers a definition of poor rubber as a substance "that fails to do the job for which it was intended."

As a step toward answering the question of rubber quality in the marine industry, where a major application is for fenders that are used as part of dock protection systems, Trelleborg has developed a specific test regime for rubber fenders. The test to analyze the consistency and chemical composition of the rubber avoids the need for destructive testing of the product in order to establish the quality and performance of the material. Instead from only a 50 gram sample an indication of performance in application and the lifetime of the fender in use can be gauged.

Previously, such large components would have had to undergo destructive testing to determine quality and performance, so the ability to use a small sample to provide a reliable indication of quality is a major step forward for marine applications. In addition, Kumar points out that for some producers there was no guarantee that any testing was carried out prior to delivery or that the rubber compound conformed to the specification. This test removes that uncertainty.

For many of the applications for which Trelleborg develops solutions, Kumar believes that customers need to appreciate that the rubber material is part of an engineered solution. Such advanced materials as steel have clearly defined specifications, he says, and rubber components that work alongside steel in marine protection systems should meet their own clearly defined standards. Trelleborg's testing system is an important step in that regard. "It is all about setting standards and making sure those standards are met," he says. ■

PERSONAL DETAILS

Mishra Kumar joined Trelleborg in 2002 as head of the rubber-mixing unit in Singapore and had several other technical positions before moving to his present job. Born in India, Kumar studied chemistry and polymer science at Calcutta University and earned an MSc in chemical technology at Bombay University. He has also completed an MBA at the University of Chicago in the U.S.

He lives in Singapore with his wife, two teenage sons and their poodle, Buchu. When not strolling with his dog, he plays golf, takes his sons to rugby matches or watches cricket.

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Measuring quality for the marine industry

Millions of dollars are being invested in establishing ultramodern port facilities around the world. Protecting ships and berthing facilities is the job of fenders, highly engineered steel and rubber components that take the impact of the ship as it docks. Although there are specifications for the performance of the fender related to the velocity of impact and to temperature variations, reliable testing for rubber-quality without destruction of the fender was not available until Trelleborg developed its analytic method.

The analysis method requires only a small number of test samples that undergo chemical analysis. A Fourier Transfer Infrared spectrophotometer and a thermogravimetric analyzer are used on a 50 gram sample to identify the composition of the rubber component and the proportion of polymer to filler.

The test shows that the factors that determine the best-performing rubber compounds for fender application require a polymer-to-filler ratio greater than 1.2 and a density of less than 1.2. The life of a poorly formulated rubber compound may be 10 times less than that of a high-performance one, which can have a lifetime approaching 60 years. The importance of understanding rubber quality therefore takes on crucial significance when choosing a supplier.

A GOLDEN NUGGET

TEXT LINAS ALSENAS **PHOTO** BREN DENDY

Welcome to Rutherfordton, North Carolina. It may appear to be a typical small American town, but dig a bit deeper and a rich history is revealed.

SMALL TOWNS in the United States hold a special place in the national imagination. With their easy access to nature, charming main streets and quirky local traditions, they balance individual freedom and community spirit in a way that reflects American ideals. One such small town is Rutherfordton, North Carolina, located in the scenic foothills of the Blue Ridge Mountains (where such films as Dances with Wolves and Dirty Dancing were filmed.)

Rutherfordton has only about 4,200 residents, but it has a long history. Founded in 1787, it was home to the first post office, school and newspaper in western North Carolina. More than 50 buildings, mostly in Rutherfordton's downtown area, are listed in the US National Register of Historic Places. Perhaps the most notable chapter in the town's history centers on gold.

Many are surprised to learn that the first and longest gold rush in America took place in North Carolina around the turn of the 19th century, decades before the more famous 1849 gold rush in California.

In 1799, a boy living in Cabarrus County (an hour and half drive from Rutherfordton) brought home a heavy, shiny rock that he had found in a stream.

The family used it as a doorstop for three years before his father, a farm laborer, sold the rock to a local jeweler for three and a half dollars, about a week's wages at the time. The 17-pound nugget of gold, the first documented gold find in the United States, was really worth a thousand times more.

It is believed the farmer, after realizing his mistake, eventually did get perhaps 1,000 dollars more from the jeweler, and he continued the gold search with two partners. In their first summer, a slave who had been set to work searching part-time discovered a 28-pound nugget.

THESE SPECTACULAR finds sparked "gold fever," and soon the region was flooded with migrants hoping to strike it rich. Large commercial mining operations were set up in parts of the state, but the gold hunt in

Trelleborg in the US

The US is the biggest country for Trelleborg in terms of net sales as well as number of employees. Trelleborg has some 20 manufacturing facilities in the country and even more market offices; from Boston, Massachusetts, in the east to El Segundo, California, in the west, from Portland, Oregon, in the north to Houston, Texas, in the south. Trelleborg's structural activities are high and the most recent investment in the U.S. is in a production facility for agricultural tires in Spartanburg, South Carolina, which will give proximity to both existing global customers as well as a potential expanded customer base.

DAYTRIP PARADISE

*"A lot of people underestimate this area," says **Lisa Cobb**, Quality Specialist at Trelleborg Coated Systems in Rutherford County. "But within a one or two hours' drive, you have everything you could want."*

Cobb grew up just outside Rutherfordton. "Everybody knows everybody here," she says. "In fact, I went to high school with five people who work at Trelleborg with me."

Cobb lists some popular day-trip destinations:

- The Biltmore Estate, the spectacular late-19th-century country estate of the Vanderbilt family in Asheville, North Carolina
- Harrah's Cherokee Casino Resort
- A number of world-class golf courses, such as Apple Valley Course and Bald Mountain Course
- Ski areas, such as the Appalachian Ski Mountain or Sugar Mountain resorts
- Charlotte, a city in southern North Carolina, about an hour away. Sports fans can watch the NFL Panthers or the NBA Hornets play, while racing enthusiasts can visit the NASCAR speedway or the National Hot Rod Association drag-racing strips. Cobb enjoys going to the US National Whitewater Center there, a facility where athletes train for the Olympics. "They have bike racing, zip lines, lots of outdoorsy activities," she says.

Rutherford County stayed small-scale, mostly by panning in local streams. It was difficult work, but it produced an astonishing quantity of gold.

The Bechtlers, an enterprising family of German immigrants, set up a private mint just outside Rutherfordton. Locals would bring their gold finds to the mint to be refined, paying the Bechtlers a small percentage of the value. Between 1831 and 1840, the mint produced almost 2.25 million dollars in gold coins and refined another several hundred thousand dollars' worth.

THE BECHTLERS ALSO had the distinction of being the first in the US to mint a one-dollar gold coin, 17 years before the federal government created its own. In an area and a time when federal coins were rare, this local currency transformed the market from a barter system to a modern economy.

The Bechtlers' mint did not last, for a number of reasons. The men in the family died in rapid succession, possibly because of mercury exposure in the gold-refining process. Moreover, in 1835 the US government opened three federal mints, including one in North Carolina.

In truth, gold finds in North Carolina were becoming smaller and increasingly rare, although the state would continue to lead the nation in gold production until 1848, when the California gold rush began. Today there are still a number of mines in western North Carolina available for tourists to visit and learn the process of panning for gold. But gold isn't the only treasure to be found in these hills; the Blue Ridge Mountains comprise a complex mixture of igneous, sedimentary and metamorphic rock that contains rich deposits of gems.

TO FIND RUBIES, sapphires and garnets, the area around Franklin, North Carolina, is a good bet, while the Spruce Pine district in Mitchell County is known for emeralds and aquamarine.

A number of commercial gem mining operations are available for families to try their hand at sorting through "native" or "seeded" buckets of soil, and local artisans can turn rough finds into polished jewels. ■

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Performance sets pipe plugs apart

Trelleborg's new generation of inflatable pipe plugs has been a key factor in keeping the sewage and drainage infrastructure of one of western China's fast-growing cities in good order.

TEXT CHRIS HORTON

Chengdu, the capital of Sichuan province, is one of China's largest and most dynamic cities. Many consider it to be a showcase for the rapid development of China's once-impoverished western regions. One main area in which Chengdu has stood out from other cities in western China has been its ability to attract world-class companies to set up operations in industrial parks and satellite cities.

One of those satellite cities, Pi County, has become a hot spot for investment by electronics and high-tech manufacturers. Situated just northwest of Chengdu's urban core, this fast-developing city of nearly half a million people, with its world-class urban planning and high standard of infrastructure, is becoming home to a number of international companies.

Although Pi County's sewage and drainage infrastructure is hidden, it is a crucial part of the city's urban management. Sewage pipes frequently require testing, repairs or replacement, and to facilitate this, reliable pipe plugs are a necessity.

Zhang Linwu, director of Pi County's Drainage Facilities Administration Office, says the all-around reliability of the new generation of inflatable pipe plugs from Trelleborg Offshore & Construction has served Pi County well since early 2013.

"We've been using Trelleborg pipe plugs for more than a year now, and we're very pleased with the results," Zhang says. "The pipe plugs were recommended to me by one of my peers, who said that Trelleborg's quality and service were both excellent. We were willing to give Trelleborg a try, and after using the company's products for a while, we found that they were really quite good."

Trelleborg's inflatable pipe plugs, which use Optimized Fiber Technology (OFT), have several features that set them apart from those of the competitors.

As with all of Trelleborg's products, safety and reliability are key. Trelleborg's OFT pipe plugs are manufactured by robots, which for end users translates to consistent quality.

BUT A REAL DIFFERENTIATOR for Trelleborg's OFT pipe plugs is their superior performance, another hallmark of Trelleborg products. During the development of its OFT pipe plugs, Trelleborg produced countless prototypes, which were tested relentlessly and optimized.

In the end, the pipe plugs, reinforced with aramid, a high-performance fiber used in military and aerospace applications, offered new levels of safety and operation.

Trelleborg's inflatable pipe plugs, which use Optimized Fiber Technology (OFT), are produced in Trelleborg's manufacturing facility in the Netherlands.

In addition, the lighter the pipe plug, the easier it is for a worker to handle and install them in tight manholes and pipes. Compared with traditional pipe plugs, which weigh 52 kilograms, Trelleborg's OFT pipe plugs weigh only 35 kilograms, a difference of more than 30 percent.

OFT pipe plugs also offer the advantage of flexibility. Their light weight makes them easier to compress, and tapered ends make installation in smaller sewage pipes much easier.

Zhang says he was impressed by the responsiveness of Trelleborg's China network. "All in all, everything's been very reliable. I personally feel the after-sales service and product quality are exceptional."

In China, private and public sector clients demand a high degree of service. Trelleborg's authorized China supplier has exceeded the level of support Pi County required. A crucial factor in developing customer loyalty and word-of-mouth branding in China.

The strong reputation that Trelleborg is building for itself in Pi County bodes well for its prospects in other areas of western China, where many cities are upgrading and expanding their infrastructure.

"If after-sales service and quality are maintained at the levels we've experienced, Trelleborg will likely see more demand for its products in this part of China," Zhang says. ■

PI COUNTY

With a rapidly growing population of more than 480,000, Pi County is riding the wave of economic development that has propelled the Chengdu metropolitan area into the upper tier of Chinese cities. The satellite city focuses on absorbing high-tech investment and supporting residential facilities for workers.

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BLUE DIMENSION*

*Blue Dimension refers to products and solutions that not only satisfy the needs of the customer but also protect people, the environment and infrastructure.

Blue agriculture GAINS TRACTION

From its selection of raw materials through to the end user, Trelleborg is working toward a more sustainable tire future.

TEXT CARI SIMMONS

TRELLEBORG IS COMMITTED to reducing its own carbon footprint and those of its customers, and it is investing considerable resources to do so. Trelleborg Wheel Systems undertakes intensive research and development work together with the main tractor original equipment manufacturers, prompting sustainability consultants such as PE International, as well as the top agricultural schools in Europe, to create solutions that make a difference.

A major breakthrough came with the launch of the TM Blue™ tire concept to help farmers boost their productivity and at the same time reduce their environmental footprint.

"Cultivation accounts for more than 50 percent of the carbon footprint in the production of wheat and other cereals, and is therefore an important focal area as both consumers and farmers look at ways to improve sustainability," says Lorenzo Ciferri, Marketing Director of agricultural and forestry tires within Trelleborg Wheel Systems. "With TM Blue farmers get a higher yield and at the same time reduce their CO_2 emissions."

The TM Blue agricultural tires till the soil in a gentle manner through low compaction, which allows the soil to return to its original state, resulting in lower plant loss and higher crop yields. This contributes to a six percent reduction in the carbon footprint compared with using other premium-brand tires.

SIX PERCENT MAY NOT sound like a huge amount, but it adds up. For example, the TM1000 HP BlueTire™ tires sold in 2013 will reduce CO_2 emissions by up to 13,700 tons over the life of the tire. This is equivalent to the CO_2 emissions from about 2,884 personal vehicles in the course of a year.

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The wide footprint area, up to 13 percent wider than the market average, gives better flotation characteristics by distributing the load evenly across the footprint. The excellent traction capability of the TM Blue tires reduces slippage, which in turn reduces work time and energy dissipation, resulting in lower fuel consumption. In just one week of tilling, the tires can provide fuel consumption savings of 45 to 75 liters – and that adds up to cost savings for farmers as well.

IN ADDITION TO THE actual use of agricultural tires, Trelleborg is studying other aspects in the life cycle of tires, including raw materials, production, distribution and recycling.

In its Life Cycle Analysis (LCA) the bulk of the carbon footprint of Trelleborg Wheel Systems – 60 percent – can be attributed to raw materials (excluding the LCA's "use phase"). "We are improving the raw material phase through the eco-design of tires, selecting the right suppliers and materials," Ciferri says.

In the production process, which accounts for 30 percent of the carbon footprint, Trelleborg is analyzing each step to see how it can be more environmentally-friendly. Water recycling, projects to reduce energy consumption, using renewable sources of energy and eliminating waste are some of the solutions. Less than three percent of waste material goes to landfill sites, and environmentally-friendly extender oils are used throughout the production process to prevent the risk of environmental contamination.

The LCA shows that distribution accounts for just three to five percent of the carbon footprint, but Trelleborg is addressing this area as well by manufacturing closer to its main markets. This will help reduce CO_2 emissions caused by long-distance deliveries. Trelleborg's first North American manufacturing facility dedicated to the manufacture of premium radial tires for agricultural machinery is currently being built in South Carolina.

When it comes to the end of an agricultural tire's life cycle, Trelleborg estimates that an average of 40 to 45 percent of tire materials are recycled. "This portion increases significantly year to year, and it can potentially double within the next decade," adds Ciferri.

LOOKING TO THE FUTURE, he anticipates some big changes, especially when it comes to the use of raw materials. "Two-thirds of our raw materials are based on fossil fuels, and we know this is going to have to change," he says. "We are already working jointly with our key suppliers looking into ways to reduce our dependency on fossil fuels by replacing them with other materials, such as advanced bio-polymers to replace synthetic rubber." ■

Cranes, conventionally used for lifting, are not powerful enough to lower a 30,000 ton topside onto an oil rig jacket.

FLOATOVER SOLUTIONS

As facilities in the energy industry become ever larger, new ways must be found to install equipment. Trelleborg technology is helping to ensure that new installations just float into place.

TEXT MICHAEL LAWTON **PHOTOS** GETTY IMAGES

ONE CONSEQUENCE of the world's ever-increasing demand for energy is that energy producers must venture into locations that are increasingly difficult to access.

These locations have special challenges – among them, the construction of facilities in extremely adverse environments. And economies of scale sometimes mean that things get so big that they can no longer easily be handled by conventional means.

That's what is happening with offshore oil rigs. Conventionally, the jacket – the structure on which an oil rig stands – is secured to the seabed, and the deck, or topside, is lowered onto it by a heavy lifting crane. But with topsides now often weighing more than 30,000 tons, it's often no longer possible to use cranes.

This is where the floatover installation method comes in. The technology is used regularly for oil rigs in shallower waters and is now being used further offshore. The floatover method involves a barge maneuvering the topside between the legs of a jacket. Then the barge takes on seawater as ballast, sinking slightly so the topside is installed in place on top of the jacket.

Trelleborg supplies the leg mating units (LMUs) and the deck support units (DSUs) that make this possible. In the mating process, LMUs – steel structures with elastomer pads – take up the static and dynamic loads of the topside as well as the horizontal forces arising from wave conditions. DSUs perform a similar function between the topside and the barge's deck support frame during transit. During mating, decompression of the DSUs has to match compression of the LMUs as the two colossal units slowly join together. Sway and surge fenders protect the substructure and barge from damage.

The LMUs – one for each leg of the tower – are designed separately, using nonlinear finite element analysis to match data on expected load and movement. This is to achieve what J.P. Chia, Engineering Manager at the Trelleborg Offshore & Construction engineered products operation in Singapore, calls "the required nonlinear spring stiffness for this crucial task."

The challenges are enormous. The recent Wheatstone project off Western Australia involved a topside weighing 37,000 tons, the heaviest ever moved into place with LMUs. Another project required LMUs designed to deal with waves of up to three meters – larger than floatovers had coped with before. In both cases, the LMUs had to be designed individually for the different circumstances.

NOW TRELLEBORG IS looking into using the same technology for wind power. Offshore wind farms far from the coast need offshore substations to convert DC power to AC power before the power is transferred to land. These substations can weigh as much as 22,000 tons and Trelleborg is working to offer floatover technology to place them on offshore jackets.

"Traditional transport and installation methods in the shallow-water offshore oil industry cannot cope with the size and weight of larger topsides," says Julian Wee, Managing Director at the Trelleborg Offshore & Construction engineered products facility in Singapore. "We are predicting a similar trend in the offshore wind industry, as a floatover is more efficient, faster, safer and more cost-effective."

So as the hunt for more energy continues, Trelleborg is helping to harness conventional sources more effectively, as well as making possible the next big leap into alternative energy. ■

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Since the launch of the iPhone in 2007, the market for apps has exploded. Like many other international companies, Trelleborg is eager to provide user-friendly apps that help its target groups save time, reduce their workload and solve problems.

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TEXT ERIK ARONSSON **PHOTO** TRELLEBORG

Keeping up with the app development

TODAY TRELLEBORG GROUP offers over 20 apps, primarily for iPhones but also for Android devices – and more apps are to come in the future. Why? It is clear that people are interacting with Trelleborg more and more via mobile devices, and targeted apps can significantly improve the user experience, whether you want to check the optimal tire pressure for your tractor, calculate which anti-vibration solution is most suited, or access the latest presentations from investor relations events.

The apps offer a good complement to Trelleborg's standard websites. On these apps relevant content is available to the user who wants to regularly have quick access to this content in order to carry out specific tasks – both in-and outside an office environment.

One business area within Trelleborg Group that has built a particularly strong app presence is Trelleborg Sealing Solutions. Internal app development at Trelleborg Sealing Solutions took off in 2010 with the launch of the ISO Fits app, which helps users determine tolerances according to ISO 286. The concept for this app was founded on Trelleborg's strategy for all the apps it has developed so far.

"The app should help our main target group, primarily design engineers at equipment manufacturers, save time, reduce workload and solve specific problems, and it should easily be available everywhere 24/7. It's about making it easier for customers to do business with us," says Wolfgang Heinrich, Project Manager Web and Mobile in the Trelleborg Sealing Solutions global marketing and communications department.

In 2011, Trelleborg Sealing Solutions released its second app, Unit and Hardness Converter, which was aimed at design engineers who work with technical units every day, as well as consumers or anyone else who needs to convert units or even currencies. The app proved to be an instant success with massive download figures. During one week it even beat the popular Angry Birds game on the German download charts.

Today, Trelleborg Sealing Solutions has a range of 10 different mobile apps, each for iOS and Android, and is working continuously to develop new apps. Overall, they have achieved around 1.2 million app downloads and received more than 1,200 user reviews in the App Store, with an average rating of 4.5 stars out of five.

Ideas for new apps are mostly generated internally in conjunction with its customers. If an idea is deemed suitable for development, Heinrich writes a concept document that describes what the app is supposed to do and look like, and manages the project with the development team in India until the app release.

The future of app development at Trelleborg seems bright, but jumping into a mobile-only strategy would be the wrong approach, Heinrich says.

"The general approach should be focused more toward a multi-device strategy, always depending on usage. Online activities should be targeted at as many devices as possible and in the future should include multiple devices such as smart watches or other wearable devices, such as Google Glass." ■

Apps give Trelleborg customers access to relevant, targeted information at all times.

Keeping abreast of facts

Anyone who clicks around on the Internet knows that we are faced with a deluge of facts – more than ever before. But all facts are not equal. The trick is to separate the true and necessary and up to date from those that aren't.

TEXT ELAINE MCCLARENCE
PHOTOS RYAN NICHOLSON

SAMUEL ARBESMAN

Education: Brandeis University and a PhD from Cornell University.
Lives: In Kansas City, Missouri, US.
Inspired by: "I just try to read as broadly as possible."
Recommends: The book '*How I Killed Pluto and Why It Had it Coming*' by Mike Brown, an exciting account of how science is done and how Pluto got demoted.

Today humans have more facts at their fingertips than at any time in history. How can we tell when a fact has reached the end of its useful life, has moved to greater importance, needs to be refined or is simply wrong?

This is where Samuel Arbesman comes in. He is a complex systems scientist who is interested in how science and technology evolve and the development of tools to assess the relevance of current scientific knowledge. Arbesman is a Senior Scholar at the Ewing Marion Kauffman Foundation and a fellow at the Institute for Quantitative Social Science at Harvard University in the US. He is also the author of the highly praised book, *The Half Life of Facts*, in which he lays out his ideas that, in essence, every fact we learn in life has an expiration date, much like food on supermarket shelves. The problem is being able to assess which facts are reaching the end of their useful life and what new facts are the likely candidates to replace obsolete ones.

Arbesman has a background in computational biology. As a research fellow in the Department of Health Care Policy at Harvard Medical School he used complex computer modeling to study the interaction of social systems. "This led me to look at scientific endeavor and how this changes over time," he says. He explains that the same tools that can be used to study the interactions of biological systems such as proteins or even the collaborative interactions of scientists, can be applied to different fields. Scientometrics, the science of science, is a growing field that has the potential to help us track how knowledge is changing, giving us a better understanding of the world around us.

Arbesman believes that knowledge is constantly being overturned or refined according to predictable mathematical models. He says that the rules for overturning facts follow a mathematical model similar to that of the half-life model for radioactive decay. "If you look at a single atom of uranium, whether or not it's going to decay – breaking down and unleashing its energy – is highly unpredictable," he writes in his book. It might decay in the next second, or you might have to sit and stare at it for thousands or perhaps even millions of years before it breaks apart. "But with a piece of uranium containing a huge number of atoms, mathematics gives us tools to predict reliably the time when half of the uranium will decay," he says. "Facts, when viewed as a large body of knowledge, are similarly predictable."

A LARGE FRACTION OF WHAT we learn will be invalidated over time, says Arbesman. He points to an example from his own family. When his 97-year-old grandfather, a dentist, was studying biology, textbooks stated that humans had 48 chromosomes. In 1956 this was revised down to 46. He notes, "The field of medicine is one that has already recognized that much of what students learn is outdated before they finish their studies." This is why in the medical world practitioners are encouraged to continually update their learning throughout their working lives.

Of course, facts fall into a range of categories. Some facts are solid and unlikely to change; others have an

extremely short existence. But the majority of facts, which Arbesman called “mesofacts,” change according to a medium-term timescale, and these are often the hardest to deal with. Being aware that these mesofacts exist is an important first step. The second step is to realize that they do conform to a predictable evolutionary pattern. This can help us prepare for change. In the field of science and technology, says Arbesman, we can see how facts or ideas decline by tracking citations in scientific papers. For example, in the field of physics, a study will lose value, become out of date, not be considered as relevant or worth quoting any more after 10 years. In today’s knowledge-dependent world Benjamin Disraeli’s quote, “the most successful man in life is the man who has the best information”, certainly holds true. What becomes clear is that despite the constant ebb and flow of information and knowledge, there are always opportunities to benefit from new ideas in science. That is provided we are prepared to “re-examine most of what we have learned on a regular basis,” says Arbesman. For current and future generations, he says, “we must learn how to learn and relearn.” ■

Facelifted cars

TRELLEBORG HAS SUPPLIED sealing profile solutions through its partner Magna for a number of passenger car models as part of two automotive projects in the Czech Republic.

The first solution was a mud guard sealing gasket, supplied for use in the Audi A5 project and Skoda Yeti. The gasket was manufactured in thermoplastic elastomer (TPE) in Lathen, Germany.

The second solution was a bonnet seal for use in the B0 project in the production of the Toyota Aygo, Peugeot 105 and Citroen C1. The seals were extruded in Värnamo, Sweden, and then fitted with plastic fixing pins in Skoczów, Poland.

NADCAP ACCREDITED

Trelleborg Sealing Solutions is the first volume manufacturer of aerospace seals in Europe to be Nadcap Accredited. The European aerospace manufacturing center of excellence in Tewkesbury, England, now holds this important accreditation along with the Trelleborg Sealing Solutions facility in Fort Wayne, Indiana, U.S.

Proven for the Airbus A350

The world's most powerful test bench for hydraulic rod seals has been used to qualify the seals for the landing gear of the Airbus A350 jet airliner. The sealing system successfully passed 20,000 full landing cycles plus additional tests for ice scraping and water spray.

Located at the Trelleborg Sealing Solutions research and development center in Stuttgart, Germany, the test bench supports customers in proving seals for critical applications. Installed in a specially constructed well, the 18-ton, 260-kilowatt floating-mount rod seal test bench is capable of simulating, as realistically as possible, the patterns of movements and stresses faced by hydraulic rod seals in some of the most demanding applications.

"The test bench is about simulating the real world as closely as possible in the laboratory," says Eric Seeling, the engineer responsible for the design of the test bench.

LAUNCHING A DEALER NETWORK

TRELLEBORG WHEEL SYSTEMS has launched America's first nationwide industrial tire-fitting network. The Interfit service concept brings together the best in industrial tires with the best in service. By joining the program, tire servicing dealers can gain marketing, commercial and technical support as well as access to Trelleborg's IT service platform, through which they can manage their business.

"We have also created an affinity program for dealers that further enhances the offering," says Jason Canning, Program Manager. "As dealers progress up the program, they receive additional benefits, including enhanced support and commissions."

To find out more or inquire about becoming part of the Interfit Dealer Network, visit www.interfit-usa.com.

WATER INJECTION PACKAGE

The pump manufacturer Ruhrpumpen has chosen gimbal mountings from Trelleborg Industrial Solutions for its water injection package for liquefied natural gas in Gjerdrum, Norway. The package is placed on a specially designed floating production, storage and offloading (FPSO) vessel from Sevan Marine, the Sevan Voyageur.

Trelleborg's gimbal mountings will be used as a three-point suspension system to protect equipment from vibration and the vessel's movements.

Isolation systems play an important role in protecting high-value installations. By reducing vibration, shock and structure-borne noise, they improve efficiency, safety and the working environment.

Coated fabrics business expands in North America

Trelleborg has acquired U.S.-based companies Uretek LLC and Archer Rubber Company LLC.

Uretek and Archer develop and manufacture urethane-coated fabrics and rubber-coated fabrics. Their products and solutions are used across segments such as aerospace, healthcare, outdoor recreation, government and defense.

Dario Porta, President of the Trelleborg Coated Systems business area, says: "The acquired businesses have superior technical knowledge with focused R&D and product development, in addition to solid partnerships with customers. The acquisition complements our existing business in engineered fabrics and broadens our product range in North America."

TRELLEBORG

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative engineered solutions accelerate performance for customers in a sustainable way. The Trelleborg Group has annual sales of about SEK 21 billion (EUR 2.5 billion, USD 3,3 billion) in over 40 countries. The Group comprises five business areas: *Trelleborg Coated Systems, Trelleborg Industrial Solutions, Trelleborg Offshore & Construction, Trelleborg Sealing Solutions* and *Trelleborg Wheel Systems*. In addition, Trelleborg owns 50 percent of TrelleborgVibracoustic, a global leader within antivibration solutions for light and heavy vehicles, with annual sales of approximately SEK 15 billion (EUR 1.7 billion, USD 2.3 billion) in about 20 countries. The Trelleborg share has been listed on the Stock Exchange since 1964 and is listed on NASDAQ OMX Stockholm, Large Cap. *www.trelleborg.com*

A black starfish?

No, the answer is much more elevating than that. If you can't guess, peek to the left.

A Trelleborg Lifting Bag, capable of lifting loads of up to 67 tons with compressed air.

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Our innovative engineered solutions accelerate performance for customers in a sustainable way.

Visit our showroom The World of Trelleborg at
www.trelleborg.com

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