The Magazine from Trelleborg Sealing Solutions

in the groove

The world of seals and service

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HEALTHCARE & MEDICAL

Precisely Pumped

Helping development of an effective micro-injection pump.

eMOBILITY

All-Electric Road Trip

What challenges exist in the automotive industry?

VIRTUAL CONFERENCE

The Future of Manufacturing

A discussion on future trends and technologies.

CONTENTS

NEWS

AWARD

Composite Pioneer Awarded

David Hauber, Technology Engineer for Trelleborg Sealing Solutions, received the American Composites Manufacturers Association (ACMA) Pioneer Award on October 18, 2021 at a special ceremony during the CAMX show. Created in 2019 by ACMA, the award recognizes individuals who have developed, enhanced, or created processes and/or materials that have advanced the composites industry.

David was one of the first inventors of an additive manufacturing technology, which he called ballistic particle manufacturing, now referred to as direct jetting and directed energy. When advanced thermoplastic composites became available in the 1980s, David and a team of experts combined Automated Fiber Placement with thermoplastic composite materials, developing in-situ consolidation (ISC); a process used daily to manufacture Trelleborg's world class thermoplastic composites.

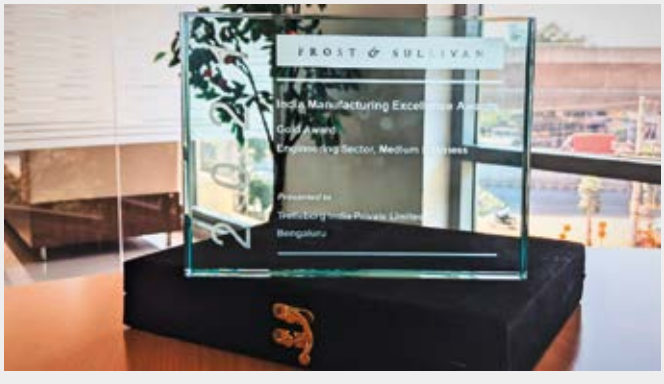
David Hauber receives Pioneer in Composites Industry Award

AWARD

Trelleborg Sealing Solutions Bengaluru Wins Gold Award

Frost and Sullivan's India Manufacturing Excellence Award recognizes companies at the forefront of Industry 4.0 adoption, and evaluates manufacturing capability, extended supply chain reliability, and technology adoption.

Trelleborg's award is in the category of Engineering Sector, Medium Business. This is the third time that the Trelleborg Sealing Solutions facility in Bengaluru has been participating in the competition, receiving a Silver and Gold Certificate of Merit in 2013 and 2015 respectively.



Gold Award for Trelleborg Sealing Solutions in Bengaluru

PEOPLE

Inspiring the Next Generation

Sudha Chandrasekharan, General Manager of the Trelleborg Sealing Solutions facility in Denver, Colorado, spearheaded Trelleborg's Women Influencers program, which connects women leaders in the manufacturing industry and helps guide and support the next generation.

Sudha was inspired to create this platform because of the support she received in her own life growing up.

For the inaugural event of the Women Influencers program, seven women in the manufacturing, technology, and supply chain industry participated in a virtual panel discussion about how to bridge the gap in their fields, particularly in aerospace. The discussion explored the panelists' leadership philosophies and their views on gender diversity and inclusiveness in manufacturing, technology, and supply chain roles.

ACQUISITION

Trelleborg Acquires VB Seals Inc.

On October 8, 2021, Trelleborg Group, through its business area Trelleborg Sealing Solutions, signed an agreement and finalized the acquisition of the privately owned US-based VB Seals Inc. The company specializes in the distribution of polymer seals such as O-Rings, hydraulic seals, diaphragms, and specialty kitting for original equipment manufacturers in several industries, including agriculture.

The acquisition increases Trelleborg's presence in the Midwestern United States. This bolt-on acquisition is part of Trelleborg's strategy to strengthen its positions in attractive market segments.

A proud history

Owner of VB Seals, Jim Van Bergen, started the business from his basement in 1990 and it grew and evolved to include a large global footprint with a team of very knowledgeable employees.

IMPRINT

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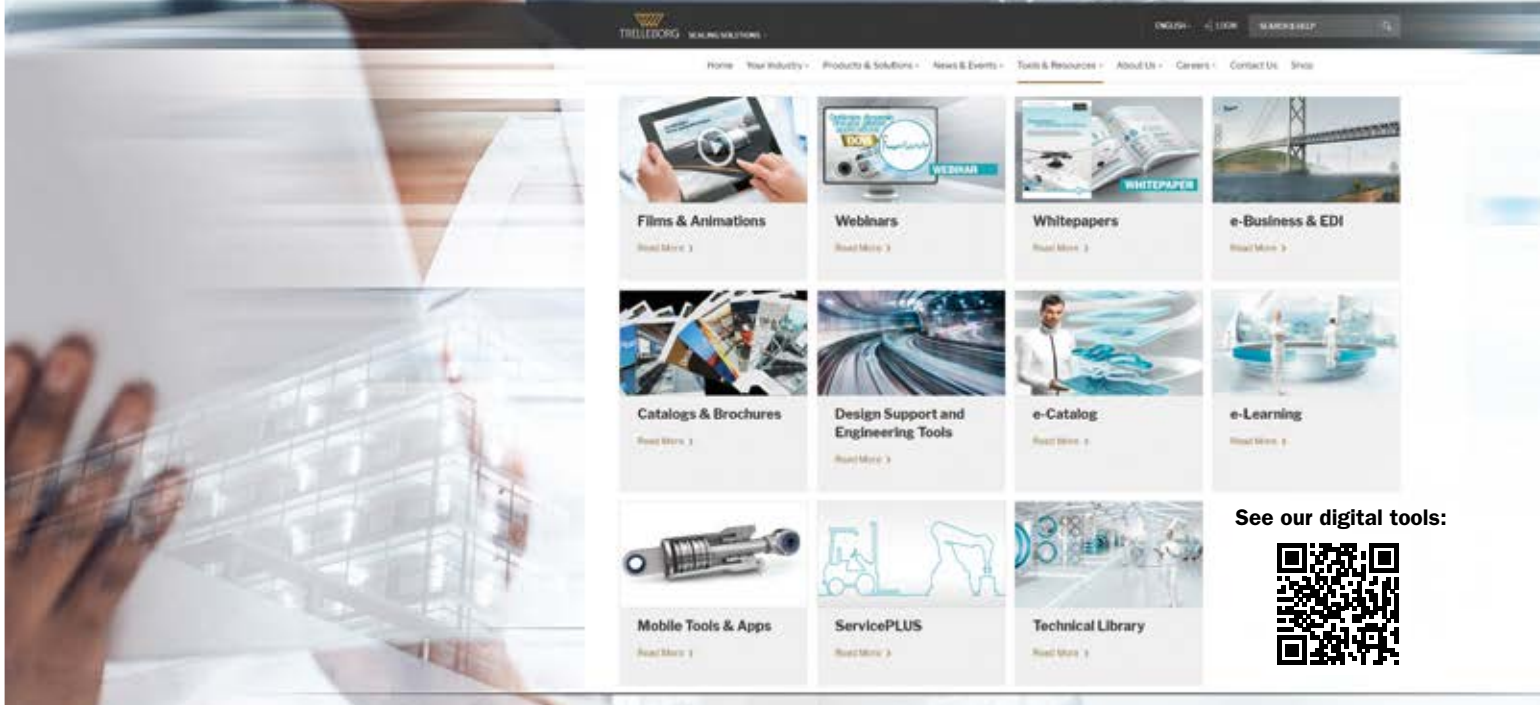
Digital Update

Discover the latest resources from Trelleborg Sealing Solutions to keep ahead of current and future industry trends.



See our digital tools:

Updated CAD Service

The Trelleborg Sealing Solutions CAD Service offers you easy access to Technical Drawing Downloads. To make it quicker and easier to create your drawings, they are available in 2D and 3D – as well as all the file formats available on the market! You can choose how to receive the CAD files - as a download to your hard drive, as an email attachment or you can import the file directly into your CAD program. The application was recently updated to include AS568 Standard O-Rings in NBR 70, NBR 90, FKM 75 and FKM 90 materials, many of which are in stock and available for quick delivery.

Demonstrating Innovative Thinking

The Trelleborg Sealing Solutions website has always been a key place to check on the latest industry trends and developments in the world of sealing. Now, a new section is being regularly updated with leading-edge products, materials and services to keep customers informed on solutions that can improve efficiency and performance. The pages feature a quick overview of the key benefits and links to resources, such as brochures, catalogs and flyers, to get all the information you need easily. Some of the the latest additions include:

Advanced Isolast® Capabilities
Complex, custom components can be manufactured using a range of innovative processes from our portfolio of Isolast® FFKM materials – making solutions that work more efficiently for longer.

iCast™ LSR
The unique iCast™ digital manufacturing process is an innovation in Liquid Silicone Rubber (LSR) processing. Involving no tool investment, it offers a cost-effective way to develop product variations or try out different design concepts before investing in serial production tools, as well as enabling the start of pre-series and series production with small batches.

XploR™ S-Seal and XploR™ FS-Seal
Commonly known as spring seals, the XploR™ S-Seal and XploR™ FS-Seal are custom-engineered, spring-energized elastomer seals. They combine the benefits of integral support components with the flexibility of an elastomer seal. These seals are ideal for use in chemical processing, chemical transportation and oil and gas applications, such as oilfield casings and tubing.

Orkot® C620
Orkot® C620 pushes the boundaries of composite technology. It is specifically designed and developed to meet the needs of the aerospace market, in particular for a strong and light material to withstand high loads and stresses over a long service life, making it ideal for landing gear.

Check out our latest innovations now!

FULL 'INSIGHTS AND BEYOND' PODCASTS SERIES AVAILABLE ONLINE

Will electric vehicle ownership really be adopted by the masses? Can Artificial Intelligence learn to become ethical? Are current working environments sustainable? Collaborating with guests and speakers from the worlds of business, industry and research, Trelleborg Sealing Solutions has released a series of ten podcasts that aim to answer these questions. Each episode covers social and technological trends affecting the polymer industry. Topics discussed revolve around digitalization, electrification and sustainability to give insider information on today's and tomorrow's engineering and sealing technology.

Listen to the podcasts through Google Podcasts, Spotify, Apple Podcasts, Deezer and Amazon Music or visit:
www.tss-podcasts.com/2

Technical Webinars

Trelleborg Sealing Solutions is supporting its customers with a series of webinars on innovation topics. They feature presentations hosted by experts and offer participants the opportunity to ask questions. The free-to-attend webinars have already proven very popular and places are limited, so make sure to register and reserve a spot!

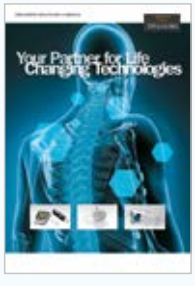
To find the next upcoming webinars and register your interest, visit:

To view recordings of previous webinars, go to:

New Literature Releases

Find out about the latest literature from Trelleborg Sealing Solutions.

Brochure – Your Partner for Life Changing Technologies



The trend to miniaturize wearable, digital and implantable medical devices offers new and life changing benefits to patients. Download the brochure to find out more about the products and capabilities that Trelleborg Sealing Solutions provides to improve effectiveness of healthcare and medical applications.

Flyer – Rapid Development Center

Trelleborg Healthcare & Medical helps medical device companies navigate the development process, from concept to market launch. Our innovative Rapid Development Center brings together experts from design, prototyping and production, to offer a unique service that optimizes both time to market and the end product.

MORE INFORMATION

To view all Trelleborg Sealing Solutions literature, go to: www.trelleborg.com/seals/literature

Whitepaper – Aerospace Composite Solutions

As manufacturers focus on the development of next generation helicopters, they are looking to new technology, materials, and designs to meet their aim for a helicopter that is faster with a longer range and increased payload. They also want greater reliability, easier maintenance and operation, lower operating costs, and a reduced logistical footprint. Advanced composite materials are essential for the light weighting needed to achieve these goals.

Whitepaper – Advanced Extrusion Techniques

Rapid growth in the medical device industry and changing patient expectations are leading to significant innovation in hosing and tubing, as manufacturers seek new processes and components to enhance their products. This whitepaper introduces the key factors to be considered in the specification of these extrusions, outlines the material options (focusing on silicone extrusion technologies), and highlights applications with real-life examples from our customers.

Advanced Isolast® Capabilities

For the most challenging applications, Trelleborg Sealing Solutions combines its engineering and manufacturing expertise with its best-in-class FFKM materials – the Isolast® range.

By Jan Sklucki

PERFLUOROELASTOMERS (FFKMS) ARE ELASTOMER MATERIALS with the highest levels of chemical and temperature resistance, capable of reliably sealing in the most extreme operating conditions. Their structure is composed of strong cross-linked bonds that combine the flexibility of an elastomer with the chemical resistance of PTFE. The carbon-fluorine bond is one of the strongest in organic chemistry. Surrounding the carbon with fluorine atoms gives a strong 'shield' that protects the polymer backbone from harsh external media. The pendant ether groups are what differentiates the polymer structure of an FFKM from a PTFE, providing extra flexibility.

The removal of hydrogen from within the matrix vastly increases the chemical resistance of the material, allowing operation at temperatures up to +325 °C / +617 °F, in steam, plasma, and vacuums. This, combined with a very low compression set and gas permeability, means FFKMs offer reliable sealing under even the most demanding application conditions.

Isolast® is the brand name for the proprietary Trelleborg Sealing Solutions range of high-performance FFKM materials and its development center can be found in Tewkesbury, England. "Isolast® withstands extreme temperatures and harsh media to provide effective and long life sealing. Even under the most challenging operating conditions, Isolast® succeeds where other high-performance elastomers fail," says Inderjeet Singh, Product Manager for Isolast® at Trelleborg Sealing Solutions. →

Above: Class 100 cleanrooms help meet cleanliness requirements for the semiconductor industry
Right: Microseals provide the benefits of Isolast® materials to applications like analytical equipment

Despite the outstanding properties of the material, the engineering and manufacturing behind the seal contribute as much to its effectiveness. An experienced development partner can also improve time-to-market and production efficiency with industry insights. “Working with Trelleborg gives you access to a wealth of engineering resources, from product and material design specialists to simulation engineers and process experts, far beyond a simple supplier,” says Inderjeet.

Indeed, the Tewkesbury facility has seen large amounts of investment into modern production methods to enable the production of seals at any scale. “The smallest end of the spectrum are probably the microseals that we manufacture for applications like analytical equipment for healthcare and medical. At the other end, we have giant O-Rings produced for the oil and gas industry or the seals we make for display panels,” explains Inderjeet.

Injection molding machines, with in-house tool design capabilities, ensure microparts can be produced efficiently and cost-effectively in large quantities. Trelleborg’s own patented Fleximold™ process permits seals from 600 mm to near-infinite diameters with the integrity of a single molded seal from a dedicated tool. "We produced the world's biggest O-Ring using this method; we have the Guinness World Record to prove it," says Inderjeet.

The semiconductor industry has some of the harshest production environments of all. Maintaining high processing yields while resisting plasma, extreme temperatures, and high pressures can be a serious challenge for chipmakers. “In processing environments, such as state-of-the-art photolithographic systems, processors are increasing yields, raising demands on seals. They are also miniaturizing products, making them more sensitive to contamination, meaning purity and cleanliness are even more important” says Inderjeet.

As a partner to the semiconductor industry for decades, Trelleborg Sealing Solutions has developed a range of techniques and materials specific to its concerns. “The Isolast® PureFab™ range has been specifically selected and formulated

> “Isolast® withstands extreme temperatures and harsh media to provide effective and long life sealing.”

INDERJEET SINGH
Product Manager for Isolast®
at Trelleborg Sealing Solutions

Benefits of Isolast

- Withstands the most aggressive chemicals and extreme temperatures – tackling the toughest environments, including plasma and vacuum
- Long service life – reducing downtime, maintenance requirements and lowering total cost of ownership
- Low compression set – increased sealing force and reduced leakage for a longer period of time
- High purity and low outgassing with cleanroom production – for ultra-clean semiconductor applications
- Resists Rapid Gas Decompression – for challenging oilfield conditions
- Available with a wide range of regional and industry specific approvals – including FDA, USP and NORSOK M-710

Above: Isolast® resists aggresive operating environments, including plasma and harsh chemistries.

for the needs of the modern semiconductor industry," says Inderjeet. "Through extensive testing and development, we ensured that these are some of the purest and cleanest FFKMs on the market."

Each of the seven materials is optimized for a specific use case to ensure that requirements can be met as cost-effectively as possible to reduce the total cost of ownership, and can be selected simply to meet time-to-market requirements. In addition, all Isolast® PureFab™ seals are manufactured and produced in a Class 100 cleanroom to guarantee purity in both production and transport to any location in the world. "Quality is integrated into the process by design, not an 'add-on' process," expands Inderjeet.

Bonding dissimilar materials together is an exact science, requiring a detailed understanding of process chemistry and materials to guarantee a strong bond. "Isolast® can be strongly bonded to metals and plastics using the latest techniques," says Inderjeet.

Bonding together different materials augments the final product with additional properties, can consolidate functions into one part, and enables more complex geometries. Installation is often made easier and fewer separate parts can be used to reduce secondary operations.

"A join between materials will always be weaker than a fully molded product. But, we have designed our bonding methods to maximize seal integrity and strength, and engineered them to be effective at the temperatures and pressures encountered," says Inderjeet.

Trelleborg Sealing Solutions has applied its innovative thinking and bonding technology to new projects for the semiconductor industry. "We've used our custom Isolast® PureFab™ bonded products to integrate damping properties in seals for lithographic equipment and increased uptime in wafer production applications," says Inderjeet.

New projects are opening up all the time for Isolast®. "We are always looking for ways to improve final application performance and will keep working closely with our customers to meet their requirements," finishes Inderjeet.

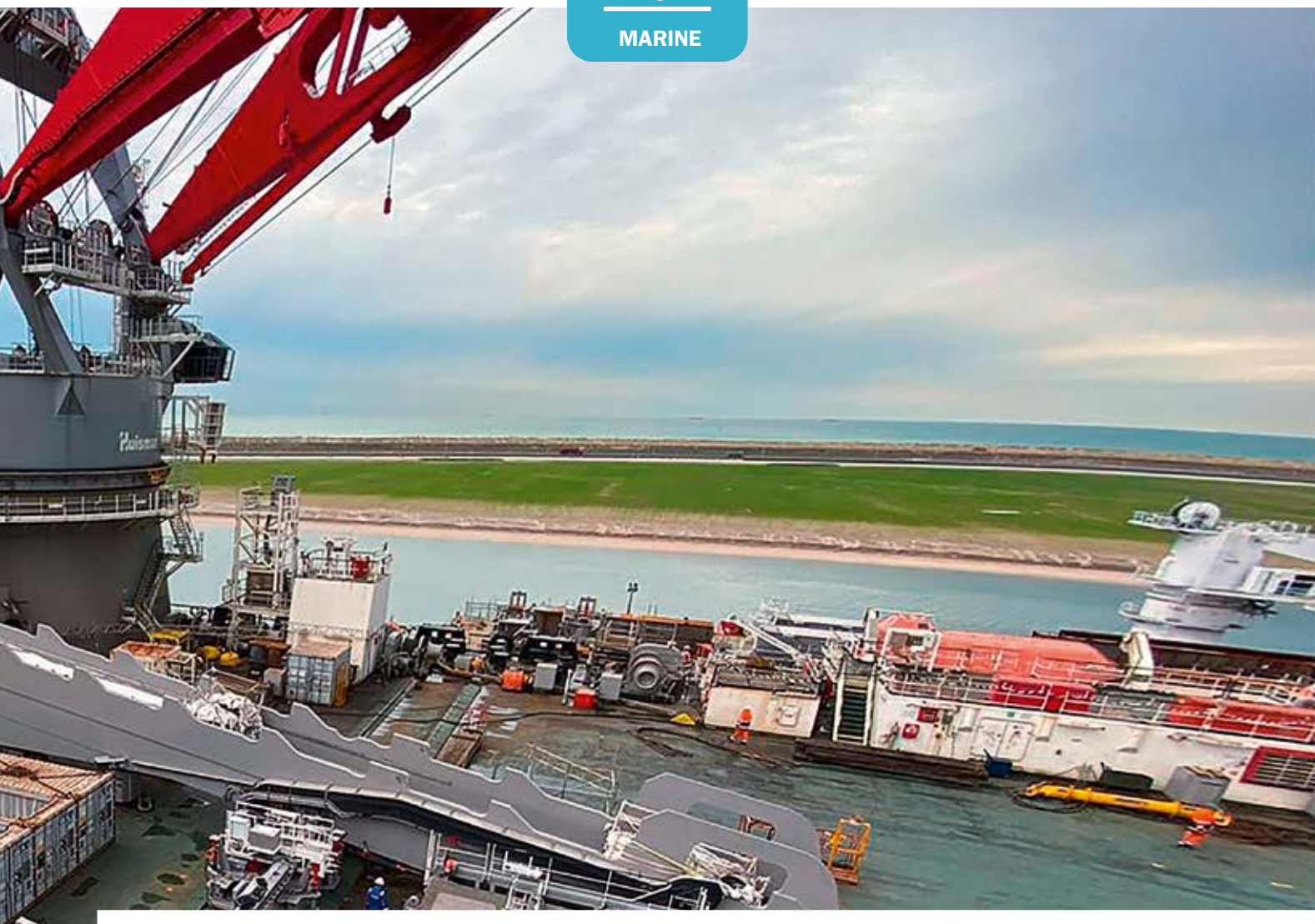
FIND OUT MORE ABOUT OUR ADVANCED ISOLAST® CAPABILITIES

Visit our Latest Innovations page and download the Advanced Isolast® Capabilities brochure to find out more about our materials and manufacturing.

Heavy Lifting

IN SHORT

1. The cost of decommissioning an offshore oil rig runs into the millions of USD.
2. Huisman BV created a more cost-effective jacket lift system for Allseas' Pioneering Spirit, the world's largest construction vessel for installing and removing oil rigs.
3. Trelleborg Sealing Solutions closely collaborated with Huisman BV to supply a sealing configuration to meet operational conditions.



The assembly of a unique jacket lift system is taking shape on board the world's largest construction vessel. Within the hydraulics, which are integral to the lift system, are advanced seal configurations supplied by Trelleborg Sealing Solutions.

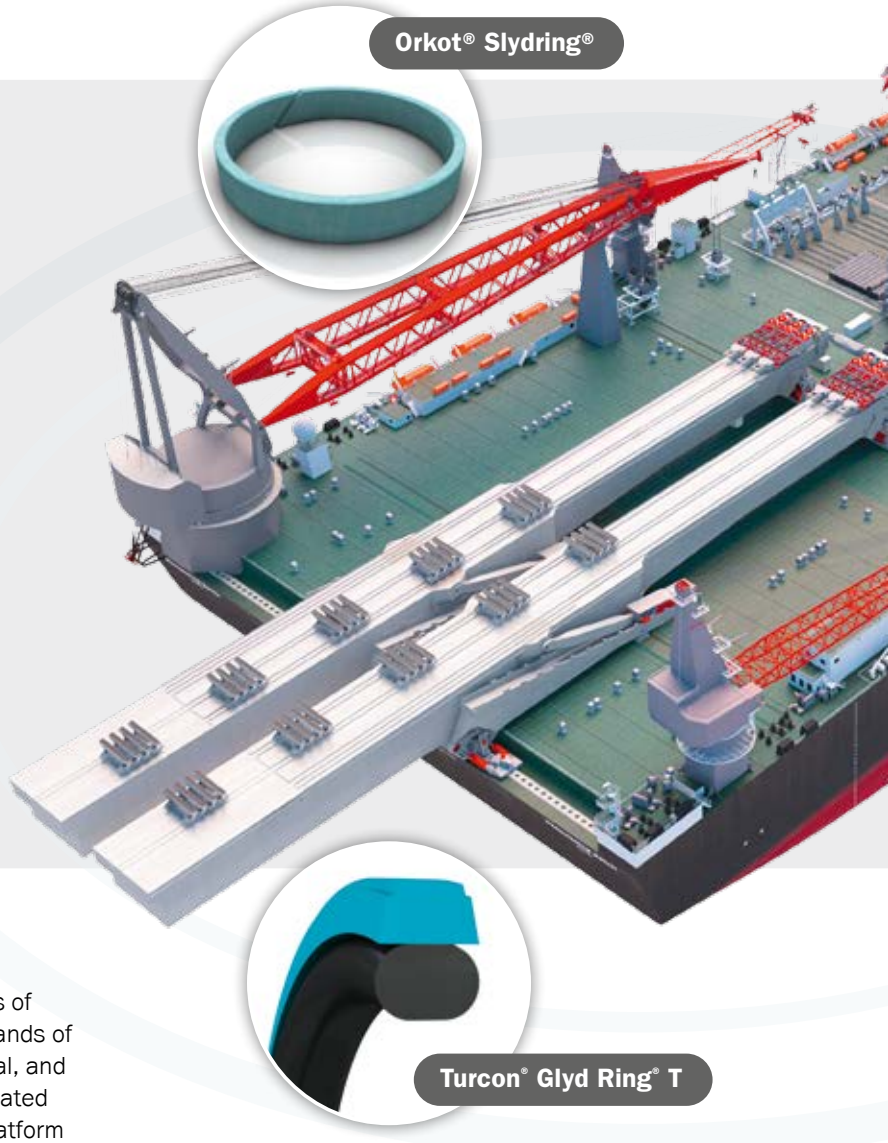
By Donna Guinivan

DESPITE THE EMERGENCE OF floating oil & gas extraction equipment, jack ups or fixed platforms still make up the majority of rigs in operation and under construction, with Asia Pacific seeing the most new build activity. In 2020, 45 jack up rigs were being built and assembly of 73 percent of these were in Chinese shipyards.[1]

Lowering costs

With rigs taking two to three years to construct at around 650 million USD each,[2] contractors and operators are always looking for ways of reducing costs. At the other end of the rigs' lives, as oil & gas fields around the world mature, there is a growing issue of decommissioning—the safe plugging and abandonment of wells and the removal of the platforms that have reached the end of their productive life. →

[1] https://www.offshore-mag.com/drilling-completion/article/14178068/ihs-markit-offshore-rig-construction-market-suffers-repeated-blows
[2] https://interestingengineering.com/the-engineering-and-construction-of-offshore-oil-platforms



ABOUT ALLSEAS' PIONEERING SPIRIT

The jacket lift system will be fitted on the existing Allseas' Pioneering Spirit, the largest construction vessel in the world, which is designed for the single-lift installation and removal of large oil & gas platforms, as well as the installation of heavy pipelines. Built at the DSME shipyard in South Korea between 2011 and 2014, the twin-hulled vessel is 382 meters long and 124 meters wide.

The new hang-off and upend system will help to raise a couple of jacket lift system (JLS). Two upend skid units will lift beams that are 170 meters long; four large hydraulic cylinders drive these. The distance between JLS beams can be repositioned in transverse direction by means of four hydraulic cylinders located on the vessel stern to accommodate different jacket sizes.

https://allseas.com/equipment/pioneering-spirit/

The UK North Sea, for instance, is one of the world's most mature offshore production basins with hundreds of platforms, millions of tons of infrastructure, and thousands of wells that will need plug & abandonment (P&A), removal, and recycling in the coming years. Decommissioning, estimated at between about nine million to 22 million USD per platform depending on size and location, is an expensive business and operators are looking for innovations like the complete jacket lift system to lower costs.[3]

A single lift

Allseas' Pioneering Spirit, once completed, is the world's largest construction vessel and boasts a hang-off and upend system manufactured by Huisman BV. This can lift a complete jacket – the steel frame supporting the decks of an offshore platform – with a single lift. Considering a single jacket can weigh up to 20,000 tons, which is equal to the weight of 200 space shuttles, this is an amazing engineering feat.

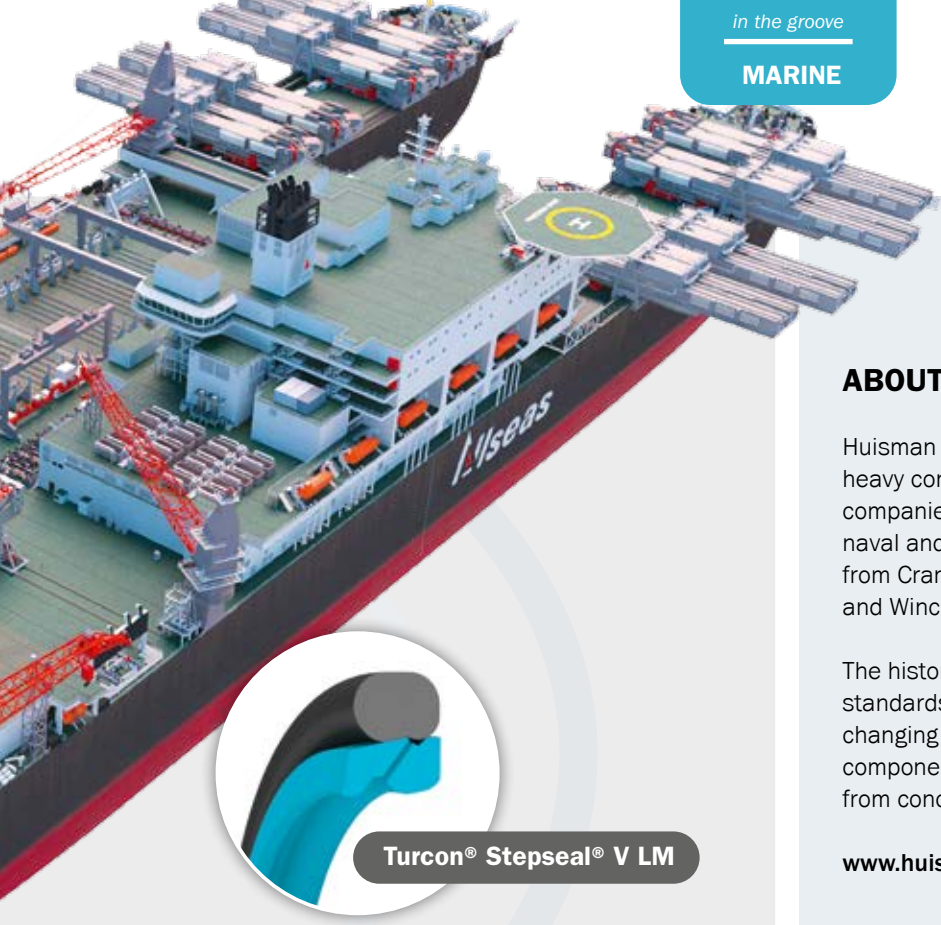
Not only will the vessel lower the costs of the installation of jackets, it will also generate large cost savings and significantly reduce safety and environmental risks in the decommissioning of old and outdated offshore rigs. Conventionally, when removing large jackets offshore, the structures require lengthy and complex cutting operations to create small sections suitable for crane lifts. Lifting a jacket off in one piece will make this unnecessary.

[3] https://www.ogv.energy/news-item/oil-gas-decommissioning-challenges-opportunities

Collaboration is key

Huisman BV's Czech subsidiary, Huisman Konstrukce s.r.o., engineered and manufactured the hydraulic cylinders. The engineering team in the Trelleborg Sealing Solutions Customer Solution Center collaborated closely with the customer to design a sealing configuration in line with operational conditions.

"We've worked with Huisman Konstrukce, s.r.o. for many years and we are currently involved in several projects," says Tomáš Pesr, Sales Engineer, at the Czech Customer Solution Center. "Supplying seals for the hydraulic cylinders of this unique jacket lift system was a very significant project. We made several designs based on the required parameters. Collaboration was at every step of the development process, from specification to the cylinder assembly, with simple assembly being one of the most important criteria."



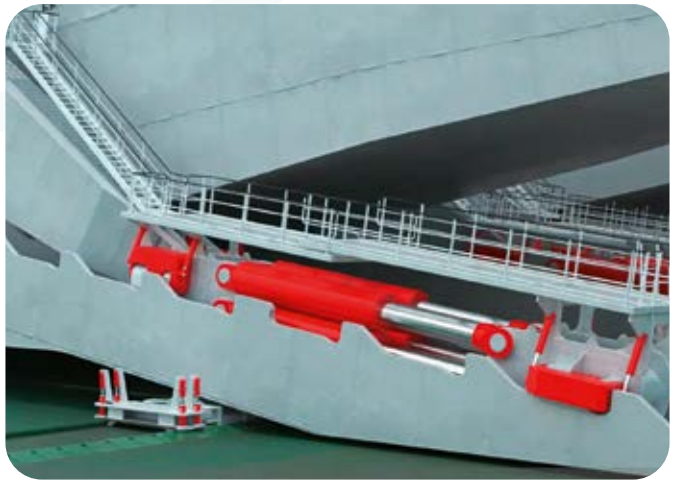
Huisman

ABOUT HUISMAN BV

Huisman BV designs, manufactures and services heavy construction equipment for the world's leading companies in the renewable energy, oil and gas, civil, naval and entertainment markets. Its products range from Cranes, Pipelay Equipment, Drilling Equipment and Winches, to Vessel Designs and Specials.

The history of Huisman is one of setting new industry standards; of making impact, since 1929. Its step changing technical solutions vary from stand-alone components to highly engineered integrated systems, from concept to installation and lifetime support.

www.huismanequipment.com



HOW DOES THE JACKET LIFT SYSTEM WORK?

To remove an offshore platform jacket, first its foundation piles are cut near the seabed. Then hoisting blocks are lowered by two towering main beams on the construction vessel and connected to hooks on the top of the jacket. Following this, the jacket is pulled out of the water over the stern of the vessel, aligned with the beams, and tilted horizontally. A reverse of the operation installs the jacket.

All-Electric Road Trip

Forget Thelma and Louise, or Steve Martin and John Candy in Planes, Trains and Automobiles. Why not join Axel Weimann and Matthias Engler on an all-electric road trip as they explore southern Germany?

By Meghan Cloud-Braunger

NOT GETTING INTO QUITE AS MUCH TROUBLE AS THEIR BIG SCREEN COUNTERPARTS, on their journey Matthias and Axel discuss the challenges of today and tomorrow that face the automotive industry and how Trelleborg Sealing Solutions is helping its customers meet those challenges.

As Global Segment Director Automotive, Trucks & Transportation, Axel Weimann knows his way around vehicles past, present and future. He and his team have now taken on eMobility, to investigate and innovate materials and processes for this exciting technology.

Axel says: "The OEMs target the international markets. They care about zero-emission cars and the only way to achieve this is to produce a better electric vehicle."

Matthias Engler, Content & Social Media Specialist, asks about electric vehicles: "Where do sealing solutions come into play?"

Axel explains: "It's in pumps, it's in connectors, and also in valves used for thermal management. Valves have a critical and very interesting role. They are responsible for generating the coolant flow to the inverter, the battery and the electric engine, keeping the temperatures of these different components within a specified range, in which the car runs most efficiently.

"Our valve sealing component is very complex. It is a multicomponent part, produced out of a mix of different materials, which are compatible with the different media used in cooling applications."

Axel and Matthias discuss the future of electric vehicles while charging their car on their trip.

Any idea how you can charge your mobile phone safely, quickly and cable-free in your car?

Axel reveals the secret is a specially designed liquid silicone rubber (LSR) mat. "The properties of LSR, combined with our tooling expertise, enable us to design and manufacture intricate, customized parts. These mats allow efficient heat dissipation during inductive charging. Without this, the charging speed would need to be reduced. The LSR material also keeps your phone safely in place, so it does not slip when braking or during sharp curves or turns."

LSR material keeps your mobile phone safely in place, while enabling faster charging.

HiSpin® – MAXIMIZING THE EFFICIENCY OF eAXLES

Even when the car is driving at moderate speeds, the eAxle is rotating very quickly – much faster than a combustion engine. This makes effective sealing more complex. Our high-speed rotary seal, the HiSpin® PDR RT ensures the gearbox stays sufficiently lubricated, while the motor remains dry. Its specialized sealing lip design minimizes friction, reducing power consumption, heat generation and wear to the seal and hardware.

Going to Market Faster

Trelleborg's Rapid Development Center accelerates the time to market for new products and provides Healthcare & Medical customers with a team of dedicated experts to support their journey from prototyping to production.

By Cari Simmons

TRELLEBORG HAS WORKED WITH HEALTHCARE & MEDICAL CUSTOMERS for more than 25 years, initially providing silicone molding for their medical devices. Today, Trelleborg can offer additional capabilities, including silicone extrusion, thermo-plastic injection molding, silicone sheeting, micromolding, slitting, bonding and laser marking on devices such as diagnostic instruments, stents and pacemakers.

> "We can adapt to our customers' needs and requirements based on their project goals."
>
> **CHRIS TELLERS,** *Director, Rapid Development Center, Trelleborg Sealing Solutions*

In 2021, Trelleborg went a step further in supporting its Healthcare & Medical customers by opening a Rapid Development Center (RDC) to help bring these products to market faster. Having a development center with a controlled manufacturing environment, full material traceability and the ability to hold tight tolerances, is crucial when considering the sensitive nature of health and medical products.

Healthcare & Medical one-stop-shop

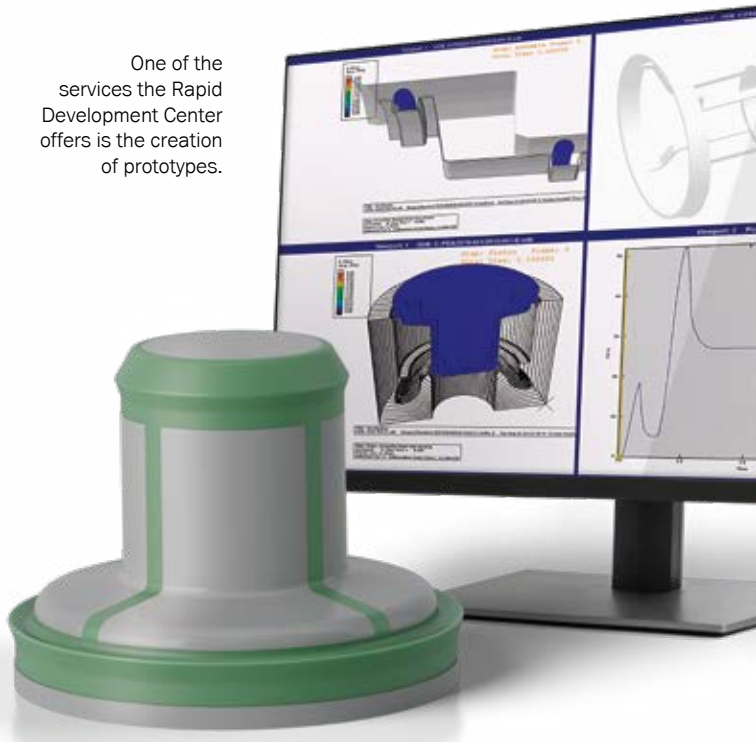
Additionally, Healthcare & Medical customers are increasingly consolidating their suppliers, looking more and more for a one-stop shop. "The RDC is Trelleborg's response to that," says Andrew Gaillard, Senior Global Commercial Director at Trelleborg Sealing Solutions, who brings his experience from working at a top medical device manufacturer to the table. "Trelleborg has expanded its material offering as well as the number of solutions we provide, such as multicomponent molding, micromolding or component assemblies."

The RDC supports customers in three critical areas: lower costs, speed to market and access to experts.

Designing for manufacturability

Through the RDC, Trelleborg is able to help customers lower their manufacturing costs by getting involved in a project early on and incorporating design for manufacturability. "Customers frequently request that we help take costs out of the manufacturing process," says Chris Tellers, Director, Rapid Development Center. "The challenge is that 80 to 90 percent of a component's manufacturing cost is designed into the product. Simple changes can have huge impacts on part cost, while having no impact on product performance."

For example, simply adding a radius can greatly reduce tooling lead times and costs, how a part fills and how easily it is removed from the tool. "This in turn allows us to have faster cycle times and lower costs," Chris explains. The RDC also helps customers accelerate time to market. →



One of the services the Rapid Development Center offers is the creation of prototypes.

Rapidly adapting and iterating

"Sometimes our customers simply need to 'fail fast', trying multiple design ideas as quickly as possible to meet a tight timeline. Our Rapid Development team and processes are specifically set up to do just that," says Chris "We can adapt to our customers' needs and requirements based on their project goals."

While the design work is underway, the Trelleborg team can simultaneously plan the manufacturing of the product. "This allows us to move extremely quickly," says Chris. "When we get started on the tooling, all the tough questions have already been answered and the team can jump right into manufacturing the tool. There is no need for another group or company to get involved, having to start over and answer all those same questions."

And although speed to market is critical for all industries in order to increase their revenues, Andrew says it is even more vital for this particular industry. "In Healthcare & Medical, launching a product early on means patients have potentially life-saving devices and therapies earlier," he says. "Another reason rapid development is critical in healthcare is the need to test functionality in a clinical setting. After testing and obtaining feedback, our customers then make tweaks and quickly get a product back into the clinical test environment."

> "We have expanded our material offering as well as the number of solutions."
>
> **ANDREW GAILLARD,** *Senior Global Commercial Director, Trelleborg Sealing Solutions*

Engineering support

Finally customers have access to Trelleborg's experts — and in many cases, access to external material experts as well, who help customers choose the right material for their product and requirements. This too can have a positive impact on costs and speed to market.

On average, the RDC has delivered parts within 15 days, and depending on the complexity, parts have been delivered in as quickly as four business days. In total, the RDC has completed nearly 25 projects, more than 40 parts, and over 20 tools. Some parts have moved on to the manufacturing team to produce them at high volumes, creating even more value for customers.

Customers have access to dedicated equipment for rapid development work.

Recently, a global medical customer approached the RDC for support on a seal prototype. "They reached out to us for our sealing expertise, design help and our ability to quickly turn around prototype samples in multiple configurations and materials. This included Liquid Silicone Rubber molded and machined parts" Chris explains.

The center reviewed a number of material options and made design iterations in just 10 business days. "We were able to help them come up with an effective design to properly fix their sealing issue for a fully functional long-lasting seal prototype," says Chris.

TRELLEBORG'S RAPID DEVELOPMENT CENTER (RDC)

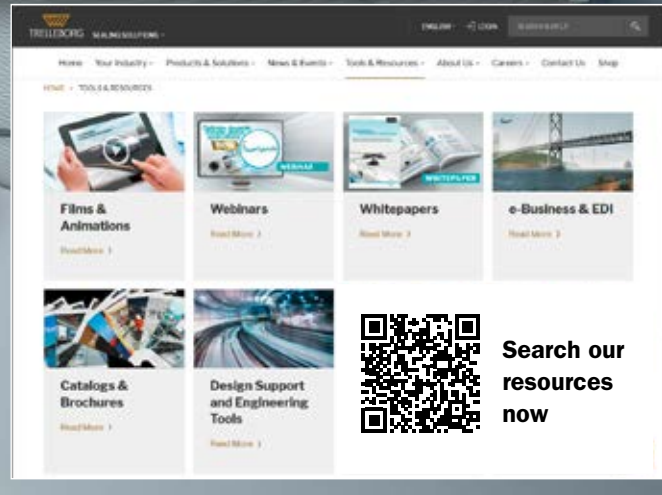
The new Rapid Development Center offers Healthcare & Medical customers silicone molding (both Heat Cured Rubber, HCR, and Liquid Silicone Rubber, LSR), silicone extrusion, an in-house tool shop, assembly, pad printing, slitting, laser marking, bonding, thermo plastic injection molding, micromolding, multicomponent molding, and an in-house automation team to develop and support high volume manufacturing.

The RDC officially opened in August 2021, in Delano, Minnesota, US, and is available to customers worldwide.

A Fluid Story

Interested in fluid power? Then why not check out our latest website updates that explore fluid power sealing applications and proven solutions to extend hydraulic system life and optimize efficiency.

By Sophie Hudson



FROM TRACTORS TO EXCAVATORS and other off-highway equipment, we understand the importance of hydraulic seals and how it's vital they prevent leakage and withstand high pressures, temperatures and transverse forces.

Extensive resources

We offer some of the most extensive resources available on our website, with literature specific to your industry. Our member area is free to join and will give you access to:

- **Catalogs and brochures**
- **Films and animations**
- **Industry specific technical articles**
- **Application focused whitepapers**
- **On-demand webinars**

Engineering support at your fingertips

You can find these resources in the Tools and Resources section of our website; all designed to support you and make specifying seals easier. There's also a range of free innovative engineering apps to download including an Area and Volume Calculator; Unit and Hardness Converter; Mechanical Engineering Calculator; as well as specialist application selectors all available from the Apple App Store and Google Play.

Turn the page to read about three key application areas for fluid power sealing.

FOCUSED ON YOUR INDUSTRY

Our website covers key application areas for fluid power sealing solutions. There you can find in-depth information for your industry.

Agriculture
Tractors and other agricultural equipment operate in environments where dirt and dust are a constant challenge. Our high-performance, long-lasting sealing solutions stand up to dirt and moisture, as well as corrosive greases and fuels, operating under high pressure and temperature fluctuations to maximize efficiency and extend product life.

Scan the QR code to download the new Agriculture Sealing Solutions brochure now

WANT MORE THAN A FLUID POWER SEAL?

THEN USE ServicePLUS.

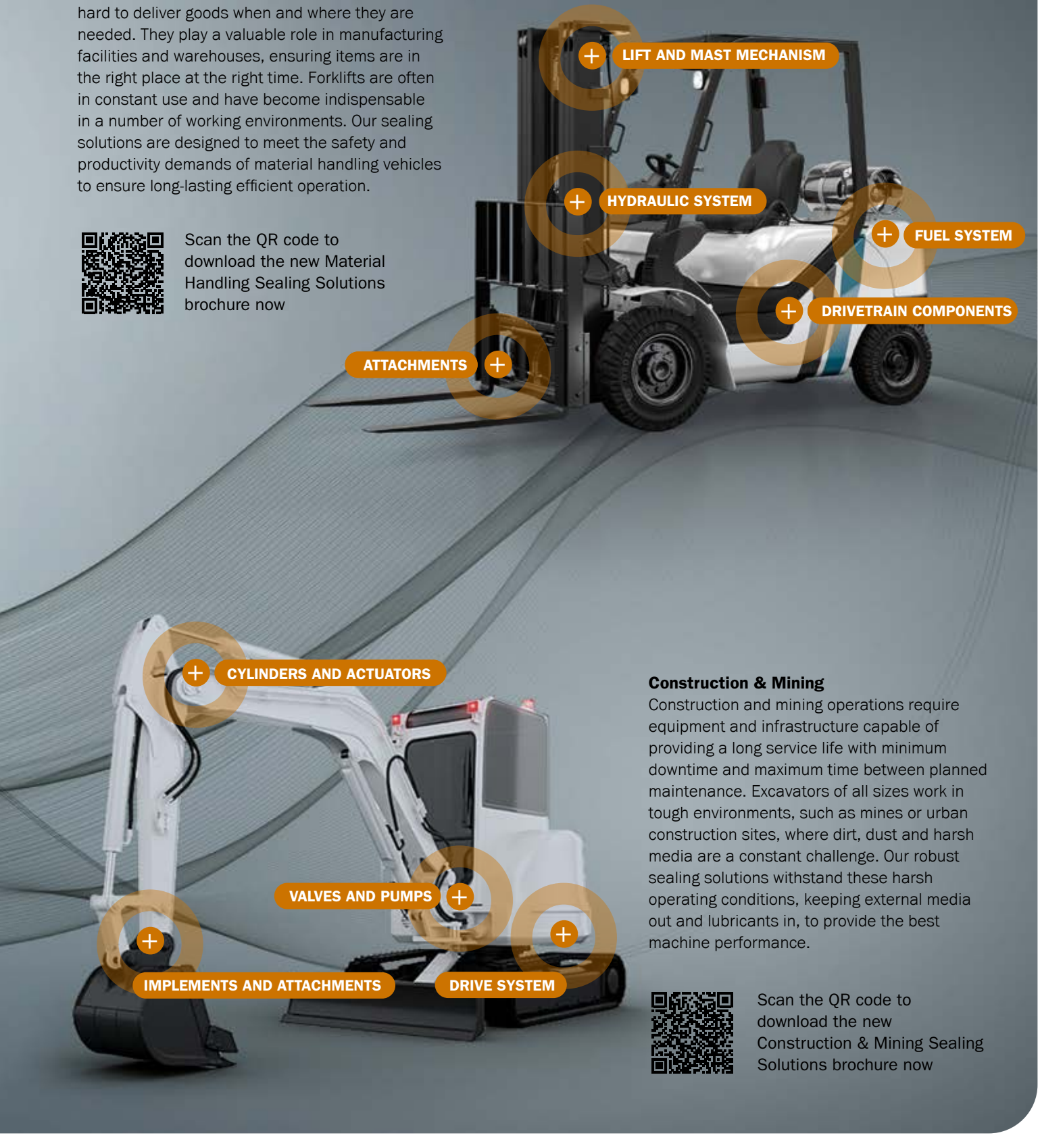
From engineering to manufacturing, procurement to aftermarket, our ServicePLUS program supports you through every step of the value chain, with enhanced services to match your needs and reduce total costs and throughput time.

Want to find out more about ServicePLUS?

Scan the QR code or visit trelleborg.com/en/seals/resources/serviceplus

Material Handling
Material handling equipment such as forklifts work hard to deliver goods when and where they are needed. They play a valuable role in manufacturing facilities and warehouses, ensuring items are in the right place at the right time. Forklifts are often in constant use and have become indispensable in a number of working environments. Our sealing solutions are designed to meet the safety and productivity demands of material handling vehicles to ensure long-lasting efficient operation.

Scan the QR code to download the new Material Handling Sealing Solutions brochure now



Construction & Mining
Construction and mining operations require equipment and infrastructure capable of providing a long service life with minimum downtime and maximum time between planned maintenance. Excavators of all sizes work in tough environments, such as mines or urban construction sites, where dirt, dust and harsh media are a constant challenge. Our robust sealing solutions withstand these harsh operating conditions, keeping external media out and lubricants in, to provide the best machine performance.

Scan the QR code to download the new Construction & Mining Sealing Solutions brochure now

In Your Own Language

Trelleborg Sealing Solutions provides unmatched levels of engineering, service, and technical support. While benefitting from our global expertise and unique offerings, customers around the world can partner with local engineers to develop customized solutions to meet their individual needs through our Customer Solution Centers worldwide.

By Maria Rifaut

Calvin Yin, Assistant Sales Director at our Customer Solution Center in Shanghai, China, answers questions on how his role at Trelleborg supports a global but local focus.

ITG: What does a typical day at work look like for you?
CY: I am responsible for the South & East China Regional Team, as well as for the Energy, Chemical and Processing Segment Team. This means I work with teams in different locations and colleagues in a wide variety of roles, coordinating activities to serve our customers more efficiently. If I am not travelling to visit customers, a typical day for me includes catching up on emails and calls, as well as tending to situations that need my attention.

ITG: How do you and your team support our customers in their daily business?
CY: My team is the first point of contact for our customers. This is very important to us and we work hard to provide first-class service in various areas that include engineering and logistics. We strive to maintain constant communication with our customers regarding projects, but also provide quick responses to inquiries coming in.

ITG: How do you interact with your colleagues globally to provide solutions for customers around the world?
CY: To provide the support and service our customers need and expect from Trelleborg, my team and I communicate with colleagues located in Customer Solution Centers around the world, not only in China. We work together with different manufacturing sites, as well as supply chain management and R&D.

ITG: What is your favorite thing about working in the Customer Solution Center in Shanghai?
CY: I like talking to people in person, so being at the Customer Solution Center allows me to have close contact with colleagues in our different departments. This is a welcome addition to talking virtually to my colleagues in other countries!

ITG: How would you describe Shanghai to someone who has never visited the city before?
CY: Shanghai is a modern, fashionable, open-minded, and multicultural city with a high consumption level and a fast-paced lifestyle.

MORE INFORMATION

Scan the QR code to learn more about our Customer Solution Centers worldwide, and to meet other local experts like Calvin.

"My team is the first point of contact for our customers; this is very important for us and we work hard to provide a first-class service"

CALVIN YIN,
Assistant Sales Director at our Customer Solution Center in Shanghai, China

ABOUT ME

Calvin's favorite movie is 'Legends of the Fall' and his favorite places to go on vacation are oceanside resorts in warm places, especially the islands of Southeast Asia.

Toward Flight Net Zero

Frauke Urban has no plans to stop flying. And neither do many of us. Not completely, anyway. That's why Urban focuses on increasing her knowledge of sustainable energy systems to help decision-makers and those in the aviation industry make flying more sustainable.

FRAUKE URBAN,
KTH, Royal Institute of Technology, Sweden

HEADING A RESEARCH TEAM that has been commissioned to help accelerate the transformation toward bio-based jet fuels, electric aircraft and hydrogen-powered planes, Frauke Urban is working with a multi-disciplinary group of researchers to map out a route for green aviation. They're identifying which conditions will enable Sweden to reach its ambitious target of making all domestic flights fossil-free by 2030 and having a completely fossil-free transport sector by 2045. Then all flights, both domestic and international that begin in Sweden, will be fossil-free.

"We could of course try to imagine a world without flying, but that would be unrealistic," says Urban.

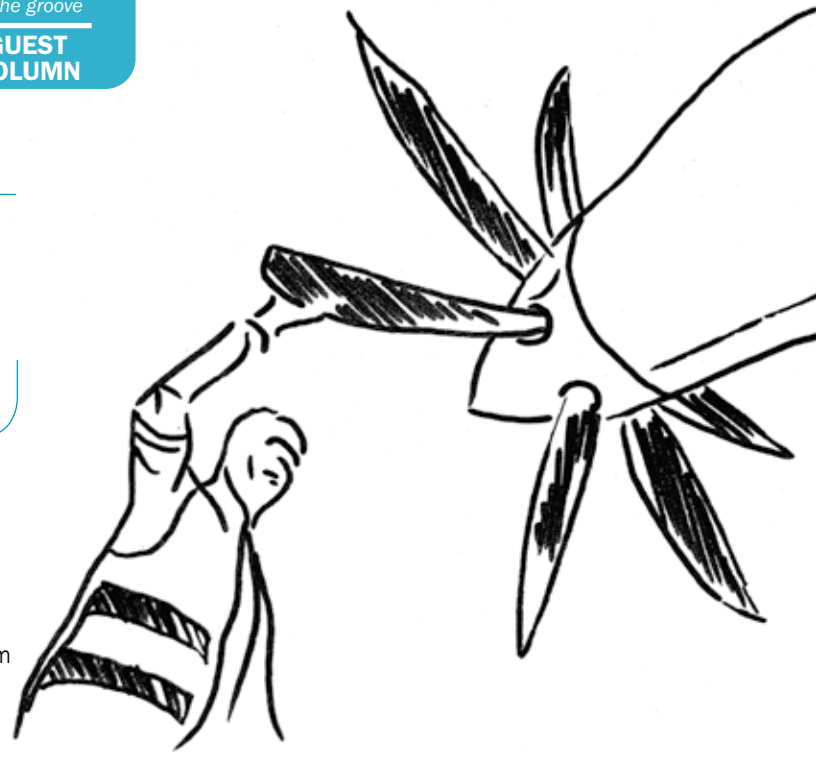
"The world is interconnected today in terms of people's movements and trade; hence people will continue to fly in the future. COVID-19 may have made many fly less than before, but aviation is here to stay."

Therefore, the major question for Urban is how to make flying more sustainable. According to the International Energy Agency, the aviation sector accounts for two percent of global CO_2 emissions. Over the past decade the industry has tried to reduce emissions by researching new materials to make planes lighter and more aerodynamic, and to make the engines more efficient. However, "That's not enough," says Urban. "To make a real difference the fuel has to be decarbonized."

One transformation that is in progress is the mixing of traditional fossil-derived jet fuels with fuels made from renewable sources. Biofuels are frequently used in Sweden, but generally in very small quantities of two to three percent of the total amount of fuel used. That's far from the possible 50/50 ratio of biofuels and petroleum-based aviation fuel. The main reasons for this modest progress are the price and supply of biofuels.

"Producers are few and biofuels are still relatively expensive. At the same time, end-customer direct support has been low, due to price and maybe also a lack of awareness of the possibility of making a personal impact," says Urban.

Today air travelers on major Swedish airlines can pay extra for the use of biofuels when purchasing a ticket. The present cost is SEK 300, or about EUR 30, per fossil-free hour in the air.



> "We could of course try to imagine a world without flying, but that would be unrealistic."

FRAUKE URBAN,
KTH, Royal Institute of Technology, Sweden

That equals about EUR 70 extra for a flight between Stockholm and London, but so far there are not enough travelers paying this additional cost to make a real difference.

In Urban's opinion, an increased use of biofuels and other drop-in fuels working in existing jet engines is a necessary transition to reach the goal of fossil-free air travel while awaiting new sustainable technologies. The outlook is promising and there are several initiatives for electrification of flights.

One example Urban mentions is aviation giant United Airlines' order of 100 ES-19 electric aircraft from the Swedish electric aviation start-up Heart Aerospace. The ES-19 is a small electric plane seating 19 passengers, which utilizes lithium-ion batteries. These are similar to those used in automobiles, but with a 400 kilometer range. Initiatives such as this make Urban confident that Swedish airports can reach their goal of fossil-free domestic flights despite there being only nine years left until the target date.

"Hydrogen-based aviation is currently in the R&D stage, driven forward, for example, by an investment by Airbus to design planes fueled with hydrogen. The EU has a hydrogen strategy in place and the fuel is projected to be used in commercial aircraft from around 2035," she says.

So, what do Urban and her research colleagues contribute to the ongoing transformation? It's her 17th year of working on industrial transformations toward decarbonization and climate mitigation. This made her initiate Sustainable Energy Transformations in Aviation (SETA), a four-year research project that is funded by the Swedish Energy Agency.

"Sweden is a leader in decarbonization and has the potential to be one of the first countries to decarbonize its aviation sector, but there are risks and challenges ahead," says Urban. →

RESEARCH PROJECT ABOUT THE TRANSFORMATION TOWARD FOSSIL-FREE AVIATION

The SETA project, involves a multi-disciplinary group of researchers from the KTH Royal Institute of Technology, and Linköping University in Sweden. The aim is to provide new insights that can help airlines, airports, regulators, aircraft producers and other players in the aviation industry fill in some of the existing knowledge gaps for a successful transformation toward fossil-free aviation.

Most of the research in this field is into the technical dimensions, as electric aircraft, hydrogen technologies and bio-fuel refinery processes need development. However, the transformation also requires new socio-economic, socio-technical, political, and sustainability-related solutions. The SETA project also focuses on these issues, by exploring options for new business models and how they can support sustainable aviation technologies.

> "Will I fly on a battery-powered plane in 2030? Absolutely!"

FRAUKE URBAN,
KTH, Royal Institute of Technology, Sweden

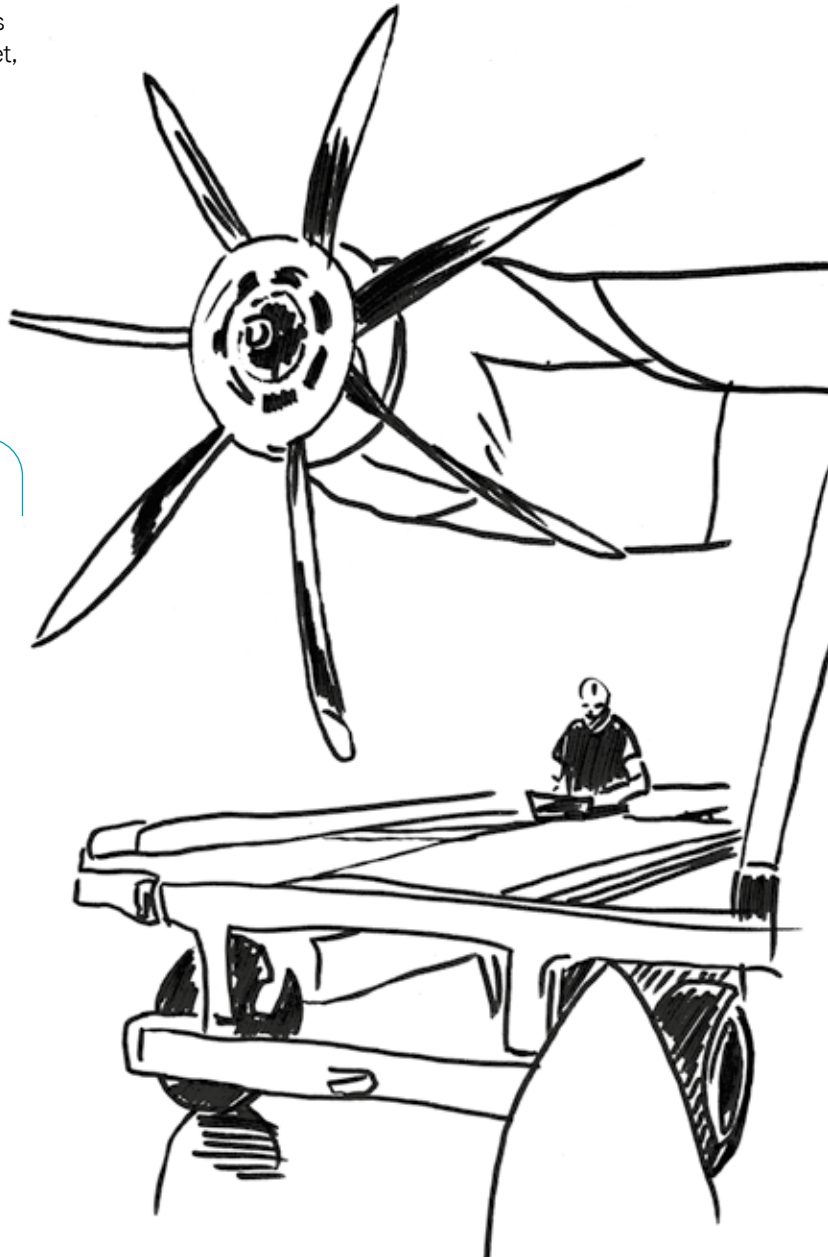
Electric aviation will need a new infrastructure for charging planes. The shortage of biofuels is another challenge. Hydrogen may lie further ahead but visions and investment still need to correlate for a fossil-free aviation industry to be possible.

"It's a bit like the 'chicken and egg' discussion. Investment is required, which will only happen if there is a predicted market, and the market will only be created if there is large-scale investment happening," says Urban.

SETA's contribution is to explore the socio-technical opportunities and barriers relating to the transformation to fossil-free flights. The multi-disciplinary group of researchers from KTH Royal Institute of Technology and Linköping University has knowledge beyond technical development – it also focuses on management and economics, life-cycle assessment and political science.

The group's work includes everything from identifying the necessary changes in governmental policies and industry investment strategies down to individual customer behavior, as well as investigating the sustainability of different fossil-free technologies for aviation. And Urban is confident that things are going in the right direction.

"Obviously, we are a small part of a much larger community who all have the vision of fossil-free aviation. Through the SETA project, the team and I can contribute to solving complex questions that relate to how the aviation industry can decarbonize and become more sustainable, with the aim of mitigating the dangers of climate change. Will I fly on a battery-powered plane in 2030? Absolutely!"



BIOGRAPHY

Frauke Urban

Lives: Stockholm, Sweden, with husband and two children.

Job: Associate Professor in the Management of Sustainable Energy Systems and KTH Royal Institute of Technology, Stockholm, Sweden.

Travel by: "I travel by bike, wherever I can. When necessary I use an e-car sharing service. I travel by plane when I visit my family in Germany."

What drives you: "I hope that my research can be one of the small puzzle pieces that solves the big puzzle of how to live more sustainably, and how to restructure economies, industries and societies in a way that mitigates climate change."

Takeoff and Landing

Orkot® advanced composite materials have been specified as standard for challenging sealing and bearing applications for decades, owing to their proven reliability and unique benefits. Recent advances in material technology have extended the capabilities of the material range into new horizons.

By Jan Sklucki

IN SHORT

1. Though metals are strong, they have issues, including weight, corrosion, and requirements for external lubrication.
2. Orkot® materials are advanced composites that provide a reliable, lightweight alternative.
3. A new material, Orkot® C620 reduces weight in aircraft and has the highest load capability, ideal for landing gear and other aerospace applications.

METAL COMPONENTS, THOUGH STRONG, have their fair share of issues. Some of the key difficulties lie in the intrinsic properties of the material: they are heavy, vulnerable to corrosion, and require external lubrication to reduce friction. Though engineers and manufacturers have worked around these problems for many years, newer solutions are more viable, more cost-effective to produce, and frequently bring advantages that metals can never provide.

"More and more specifications are now moving away from metallic components, taking advantage of the benefits of modern materials," says Shaun Walker, Development and Process Manager at Trelleborg Sealing Solutions. For example, in hydroelectric power plants, greased bronze bearings have already been replaced with self-lubricating, fiber-reinforced composites, such as Orkot®. "These support dry-running, increasing lifetime and reducing maintenance while preventing damage to the environment," explains Shaun. Similarly, in the enormous container ships that ferry goods around the world, reliability and resilience are critical. In addition to the strength required to resist the high forces within the application, they counter the corrosive effects of seawater on the bearing itself, which could then spread to the housing, requiring costly downtime.

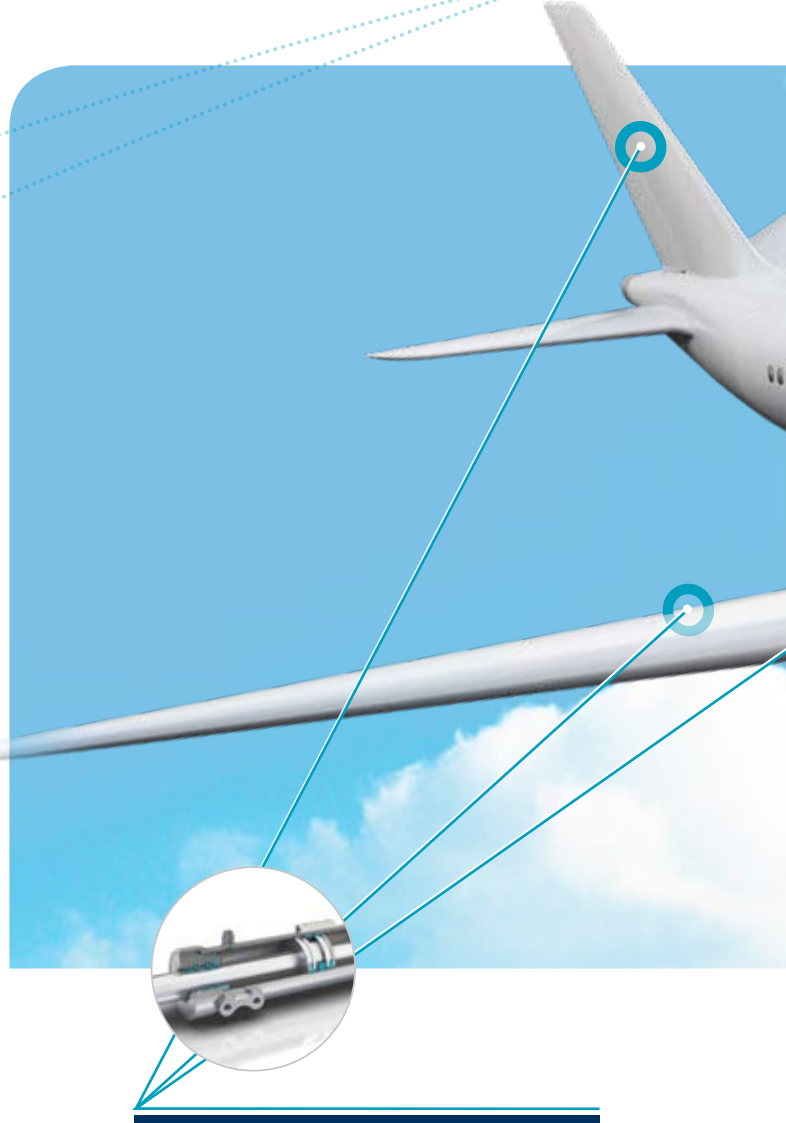
Above and beyond

High above the land and sea though, thermoplastics find one of their key applications in the skies. Trelleborg's latest material innovation, Orkot® C620, was designed with the aerospace industry in mind. It's an engineered glass-fiber composite with a low-friction Orkot® lining, strong enough to withstand the high loads of landing gear - and it's light too. "Reducing weight is a priority for improving the efficiency and fuel consumption of aircraft," says Shaun.

Fuel is a significant cost for an airline, and consumption is closely correlated to weight. A study by MIT in 2014 estimated that Southwest Airlines spent an extra $1.2 million per year to allow passengers to each carry a cellphone. To take magazines costs $5.7 million extra and to carry one laptop per person - $21.6 million. These figures show that every gram counts. An urban legend in the aviation industry says that an airline CEO ordered the removal of a single olive from each of the complementary salads, saving $100,000 on both olives and fuel. "Aluminum, steel, and titanium were the materials of choice, making up the majority of an aircraft. By switching over to aerospace-grade thermoplastics, weight can be reduced by 20%," says Shaun. →

ORKOT® IN AEROSPACE

The aerospace industry is continuing to evolve. There is a long-term trend toward the adoption of new, greener materials and solutions that reduce weight without compromising on performance or service life.



HYDRAULICS & ACTUATION

Orkot® C380, Orkot® C480
Hydraulic and actuation systems rely on Orkot® to provide smooth operation and long life.

SHAUN WALKER,
Development and Process Manager at Trelleborg Sealing Solutions

"More and more specifications are now moving away from metallic components, taking advantage of the benefits of modern materials"

ENGINES

Orkot® C338, Orkot® C406
High-load capability, good friction characteristics and low conductivity mean Orkot® can be applied to several engine components.

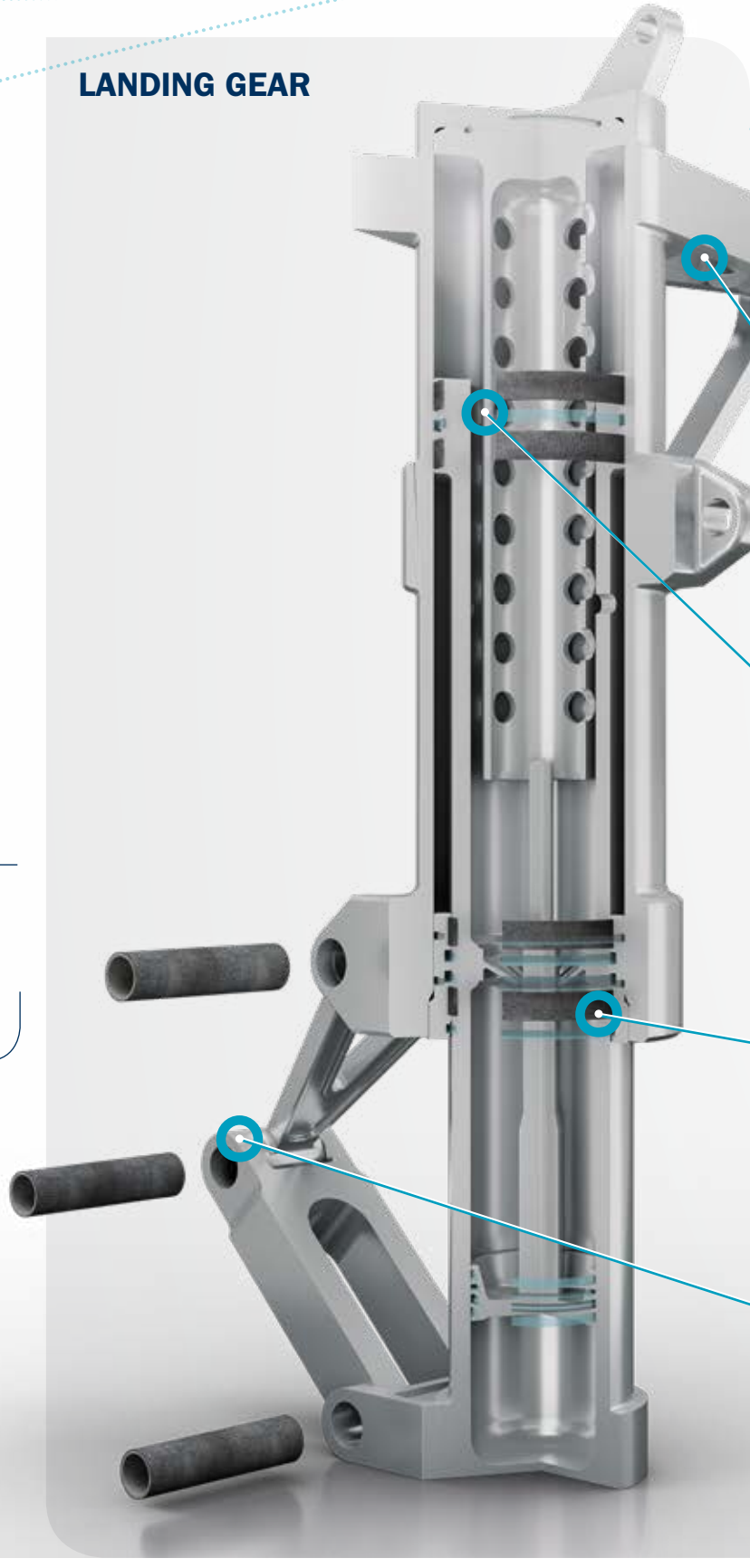
INTERIOR COMPONENTS

Orkot® C620
Overhead storage, seats and anywhere that requires grease-free lubrication can benefit from Orkot®.

STRUCTURES

Orkot® C620
Orkot® is lightweight and strong, making it ideal for structural components.

LANDING GEAR



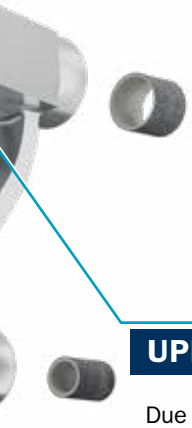
Flying far and wide

In 2017, the Australian airline, Qantas, challenged Airbus and Boeing to fly a loaded plane non-stop for 20 hours. It was clear that reducing weight would be one of the only ways of achieving this. In 2019, Qantas flew from London to Sydney non-stop with 52 passengers on board. The flight took 19 hours and 19 minutes on the QF 7879 Boeing 787 Dreamliner, with passengers seeing two sunrises on the journey. Thermoplastics composed most of the aircraft structure, replacing what previously would have been aluminum.

But weight reduction is not the only factor driving the replacement. Flame retardancy, friction-free operation, and greater design latitude are making manufacturers consider the switch for many different purposes. "When the physical properties are all considered, frequently composites are outperforming metal in applications all across the plane," says Shaun. “A lot of development focus has been on structural elements like the wings and fuselage, but even landing gear bearings are good candidates to switch over to Orkot® C620.”

> “Composites are outperforming metal in applications all across the plane”
>
> **SHAUN WALKER,**
> *Development and Process Manager at Trelleborg Sealing Solutions*

Over the years, technology for compounding and manufacturing has improved, as have the materials themselves. "Thermoplastics have been thought of in the past as too expensive or not strong enough for many uses across a plane; neither of these statements is true anymore," says Shaun. "When you see not just the costs in fuel, but all the benefits that come along with switching to thermoplastics, it's no surprise that the market is growing so rapidly."



UPPER LINKAGES

Due to the hidden position of the upper pin, reliability is critical. The small contact area, combined with high loading, requires a versatile material, such as Orkot® .

UPPER BEARING

Orkot® offers low static and dynamic friction with minimal stick-slip for smooth operation over a 20 year service life.

LOWER BEARING

The high sideloading on lower bearings mean that Orkot® is the perfect material to replace standard metallic bearings, whilst providing other benefits.

LOWER LINKAGES

Linkages, such as those within the retracting actuator, require smooth operation. Orkot® minimizes stick-slip, while reducing static and dynamic friction.

HIGH PERFORMANCE MATERIALS

ORKOT® C620

Highest load capability of all Orkot® grades. Features a self-lubricating, low friction layer on the sliding surface.

- High load capability, up to 350 MPa
- Self-lubricating and low friction

ORKOT® C384

Standard aerospace grade.
Graphite-lubricated.

ORKOT® C338

Extra chemical and temperature resistance compared with Orkot® C384.

- High temperature resistance, up to +250 °C
- Increased thermal stability and chemical resistance

ORKOT® C480

Oleophilic behavior reduces stick-slip and can be used in marginally lubricated positions.

ORKOT® C406

Resin and aramid fiber construction for high-temperature performance.

- PTFE-rich sliding layer for low friction with self-lubricating properties.

ORKOT® C380

Standard Wear Ring material compatible with all aerospace-grade lubricants.

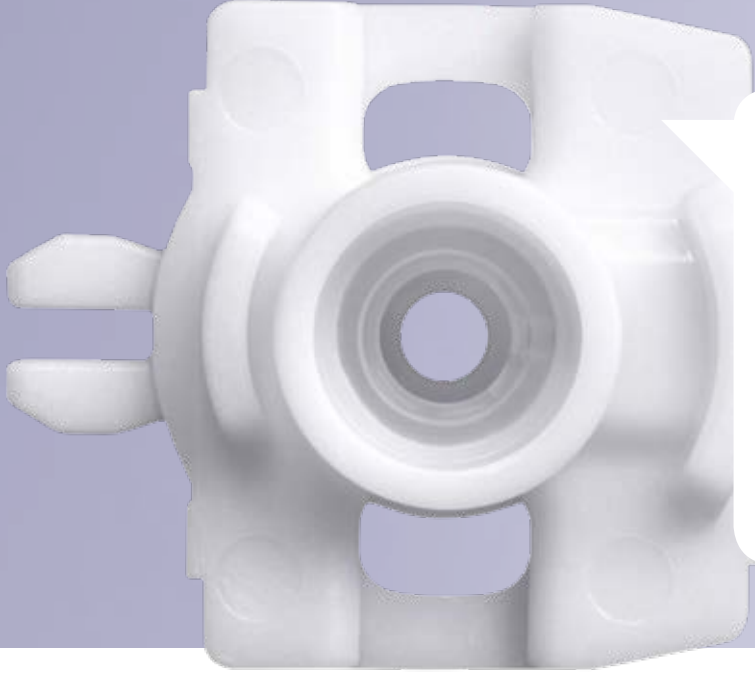
LEARN MORE:

Scan the QR code to visit our innovations page on Orkot® C620. Here you can find an overview of the material and download the brochure for breakouts, testing information and technical details.

Precisely Pumped

Handy medical devices make life easier for people with chronic conditions, and automated dosing systems are gradually replacing regular injections of essential medication. Trelleborg cooperated with WACKER to develop a microinjection pump, the very heart of such devices.

By Erik Aronsson Photo by Johanna Kassel



IN SHORT

1. Trelleborg Sealing Solutions worked with WACKER to develop a new material to ensure the smooth operation of the pump in an automated dosing systems.
2. The part could only be manufactured to the necessary dimensions and tolerances using Trelleborg's two-component injection molding processes.
3. A new material from WACKER provided the optimum solution.

COVER **STORY**

One of the most beneficial advantages of Liquid Silicone Rubber molding is that it allows the creation of complex geometries.

PEOPLE WITH CHRONIC ILLNESSES need to monitor their bodies. Diabetics check insulin levels and people suffering from Parkinson's adjust their apomorphine dosage. Incorrect administering of medication can make treatment less effective or even, in the worst cases, be life-threatening.

Some conditions can be managed well with injected drugs. Portable medical devices, such as insulin pens, are especially convenient, enabling the fast and safe injection of liquid medication in everyday situations. The users, however, still need to remember the dosage and timing precisely.

Programmed medication

Automated dosing systems go one step further. These palm-sized medical devices can be attached directly to the skin with adhesive plasters, for example. Located on the surface in contact with the patient is an extremely fine needle that extends automatically to inject a preprogrammed quantity of medicine without the patient having to make a single move. Precise control regulates delivery of as little as a few microliters of active ingredient over a period of minutes, hours or even several days. This improves the quality of life of those affected, granting them more flexibility and making delivery of medication worry-free.

The centerpiece of these medical devices is a tiny microinjection pump that reliably delivers precise doses of essential medication. Trelleborg Sealing Solutions was commissioned by one of the world's leading suppliers of pharmaceutical and medical products to help develop a pump housing made of plastic and silicone. Deep inside this pump a unique, innovative material from the international chemical company for highly developed specialty chemicals WACKER ensures smooth operation.

> "The pump's extremely precise dosage of drugs was crucial to the success of the entire device."
>
> **FELIX SCHÄDLER,**
> *Project Manager at Trelleborg*

Precise dosage

"The pump's extremely precise dosage of drugs was crucial to the success of the entire device," says Felix Schädler, Project Manager at Trelleborg Sealing Solutions, who played a key role in the development.

The delicate microinjection pump consists of a cylindrical hollow body in which a plunger is moved up and down electrically. It draws the drug from a supply vessel and conveys it to the injection needle. The pump housing comes in different versions that can deliver two microliters or ten microliters of liquid medication. With a length of 15 millimeters, the smaller pump is not much bigger than a fingernail. →

The pump housing comes in different versions that can deliver two or ten microliters of liquid medication.

Overcoming challenges

Friction, sealing and the bonding of two different materials in a very tight space posed a challenge to the developers from the start. In addition to wanting a compact design, the customer also attached importance to the lowest possible cost, as the injection pump in the final medical device is a single-use product. For safety reasons, all the elements of the dosing system that come into contact with the medication or the patient, including the injection pump, must be disposed of after use. But other components, like the housing, motor and battery, can be reused.

Two-component injection molding the only option

"Due to the compact dimensions and low tolerances involved, the part could only be manufactured using two-component injection molding with seals made of Liquid Silicone Rubber (LSR)," says Felix.

Processing LSR is the field of expertise at Trelleborg's Stein am Rhein site in Switzerland. The facility has a comprehensive cleanroom production facility for medical technology applications, where production takes place under strictly controlled and monitored conditions.

Two-component injection molding is increasingly in demand for medical applications. "Self-adhesive LSR grades are available for food-contact and medical situations, making two-component injection molding possible for these applications," says Felix.

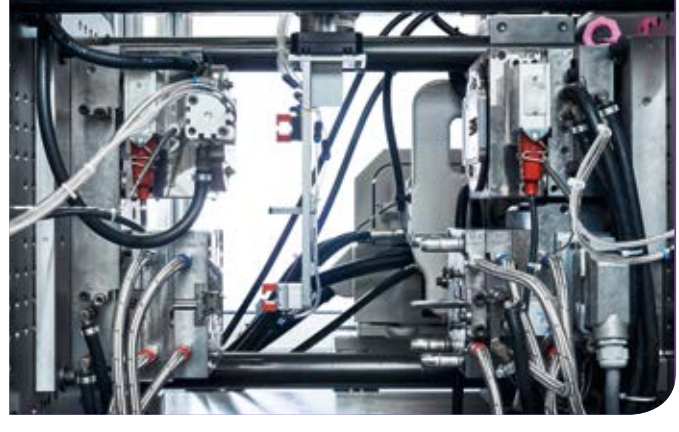
TWO INTO ONE

Multicomponent LSR technology is the simultaneous injection of Liquid Silicone Rubber (LSR) in combination with engineered plastics and other substrates. Also commonly referred to as 2K, 2- shot, 2C LSR, multicomponent injection molding, or co-injection, this technology is used to develop innovative solutions, combining two or more individual materials into one fully bonded component, in both hard-soft and soft-soft combinations.

One of the most beneficial advantages of LSR molding is that it allows the creation of complex geometries, where a number of different components assembled together can be combined together into a single component.

A focus on eliminating the need for secondary component assembly is important in lowering total cost of ownership and achieving a higher integrity product for the medical device manufacturer. A single component rather than an assembled one removes the cost and risk associated with assemblies, such as potential leak paths or undesirable spaces for bacterial growth.

By extending design options as no other technology can do, LSR molding gives an equipment developer the opportunity to go beyond function; design profiles are virtually boundless. This can offer benefits that a medical device manufacturer may not even be aware of being possible. It creates considerably more robust and cost-effective solutions that are of higher integrity, which can fit into a smaller design envelope.



The Trelleborg Sealing Solutions site in Stein am Rhein in Switzerland has a comprehensive cleanroom production facility for medical technology applications.

Identifying the correct material

When Thermoplastic Elastomer (TPE) proved unsuitable for this specific application, Schädler and his team initially turned to SILPURAN® 6700 self-adhesive LSR. WACKER has marketed specially developed silicones for medical technology under the SILPURAN® brand for a little over 10 years. “In this LSR line for sensitive applications, we use special formulations that can satisfy particularly demanding purity requirements,” says Dr. Ulrich Frenzel, who works in technical marketing at WACKER.

The exceptional adhesion to a number of thermoplastic materials makes WACKER’s self-adhesive LSR grades ideal for two-component injection molding.

Testing in application

Tests conducted with the medical-device manufacturer and Trelleborg’s elastomer laboratory in Stuttgart, Germany, demonstrated, among other things, that SILPURAN® 6700 can withstand long-term storage with the medication. Since the drugs come into direct contact with the seals, interactions of any kind had to be ruled out. When the pump’s functionality was put to the test, however, it turned out that the friction between the plunger and the cylinder surfaces made of SILPURAN® 6700 was too high.

Even the slightest over- or under-dosage of medication can lead to life-threatening situations for the patient; it is therefore essential for the pump to operate smoothly. If friction between the plunger and cylinder were high, more force would have been required for the pumping action, which in turn would necessitate a different drive and thus a larger device overall. Alternatively, the customer could have used lubricants. Those, however, would inevitably come into contact with the drug being delivered and possibly impair or, in the worst case, contaminate it. For the same reason, the use of oil-bleeding silicones, such as those offered by WACKER for automotive applications were ruled out.

New material development

But WACKER’s materials specialists managed to find a solution that works without oil.

> “A wholly new materials technology was developed and ready for marketing within just one year.”

FELIX SCHÄDLER,
Project Manager at Trelleborg

“We presented this challenge to WACKER’s material developers and they very quickly came up with some initial ideas for an innovation that might work,” says Felix. “A wholly new materials technology was developed and ready for marketing within just one year.”

Dr. Florian Liesener from WACKER’s technical marketing says, “We already had LSR with self-adhesive properties in our portfolio, as well as products with low coefficients of friction, but none for sensitive applications that offer both together. The micropump was thus the perfect opportunity for us to combine both properties in one silicone.”

High adhesion and low friction

The resulting LSR needed properties that appear physically incompatible: high adhesion and low sliding friction — in other words, holding on and letting go at the same time. Impossible, one might think. “Yet WACKER demonstrably solved this chemical conundrum, without any problems,” Felix says.

The material developed made its public debut under the name SILPURAN® 6760/50 in 2016. To this day, it is the only market-ready, self-adhesive, friction-modified LSR with biocompatibility certificates.

SILPURAN® 6760/50 plays an important and reliable dual function in the compact drug-delivery device. It may be invisible to its users, but it gives them completely new freedoms.

Virtually There

As more and more of our lives go online, we look at how Trelleborg Sealing Solutions has faced up to the challenges of supporting its customers in an increasingly digital world.

By Donna Guinivan

THE LAST COUPLE OF YEARS HAVE BEEN VERY DIFFERENT, with the Coronavirus pandemic turning the status quo in many areas upside down. Face-to-face business transactions were no longer possible, driving conversations that usually took place between engineers over a desk, online. This left many companies behind, but for Trelleborg it was a challenge they were prepared for.

Moving online

"Digital communications are not new," says Robert Zahiri, who heads up global marketing communications. "If you look at the buyer's journey, the earliest stages in making purchasing choices have progressively moved online. Engineers turn to search engines to find potential suppliers, browsing websites, reading about companies online or looking at reviews. That has become the norm."

Generally, that research resulted in a visit from a sales engineer. When that could not happen, digital communications moved from the first stages of a buyer's journey to its entire length, from initial contacts to the final purchase and beyond.

A digital presence

"This was a trend that we anticipated would happen; the situation last year just accelerated the process," continues Robert. "Our focus in developing our digital presence is obviously about making sure that we are heard in the online environment, but more importantly it's about providing a service to make engineers' lives easier.

"Over the last few years, we've invested heavily in an extensive selection of resources. These include calculators, selectors, convertors, material compatibility tools and technical whitepapers. Our renowned CAD service and sealing solutions configurator provide proven solutions with drawings that engineers can place into their designs. And for those new to sealing, we offer a wide choice of e-learnings, from basic lessons to more specialized tutorials. During 2020 and 2021, we saw substantial use of these offerings."

Social media for all

Social media has also become a critical part of the new digital reality. "Our team focuses on providing added value content over our channels and making sure our product experts feel comfortable and are effective at joining online conversations. Sales teams forced to work from home supported engineers virtually by offering advice on social networks."

And, Robert highlights, it's not just the young ones who have taken this approach. "Our most successful person in this area has been with the company for over 25 years. He's relished new technology and as an expert in his field, he's worked with many engineers on product development after making contact via LinkedIn."

ALL ACCESS

Trelleborg Sealing Solutions provides a multitude of online resources, free of charge. Where to go?

https://www.trelleborg.com/en/seals/resources

Successful webinars

Webinars have become one of the biggest new go-to points. "We ran online webinars prior to the pandemic, but it would just be a few per year. During 2021, our engineers recognized that these were a great way to replace customer visits when groups of engineers would meet together, so 32 took place." says Robert.

"There were a little under 3,000 registrations for last year's live webinars and they are becoming increasingly popular. We ran a webinar for our Seal-Glide® coating and a training session in Chinese. For each of these alone we had between 400 and 500 attendees; those are truly impressive figures."

With exhibitions and customer events cancelled, during lock downs there was a need for other ways of meeting and sharing ideas on a larger scale.

Virtual events

"For the last few years we have hosted virtual conferences for our customers within Europe that were well attended and valued. These allow us to interface on key issues, presenting our innovations to support novel product development. Our most recent virtual conference included 50 global speakers and panelists delivering sessions from 20 different locations."

Our 2021 conference with the theme 'The Future of Manufacturing' focused on current technical trends and their impact on the transformation of manufacturing processes. This event live streamed a series of 37 industry-focused, in-depth technical sessions.

Robert told us: "We checked out other companies that had tried to do this, and we wanted to do much better. So, we engaged a professional moderator and film team, involved renowned guest speakers and Trelleborg experts, hosted the events in iconic venues, as well as incorporating some fun aspects such as live music and a cartoonist; trying to make the streaming experience represent attending the in-person event.

"Spaces for our physical conference were always limited. Streaming it live meant that nearly 1,000 attendees took the advantage of being virtually present."

Here to stay

When asked if things are returning to the way they were or if they ever will, Robert said it is unlikely. "There will always be the place for face-to-face meetings but with lessons learnt, digital is here to stay."

MORE INFORMATION

Find out more in our 2021 Virtual Conference write-up on pages 42–48

Wash clothes in cold water and dry them outside instead of using a tumble dryer.

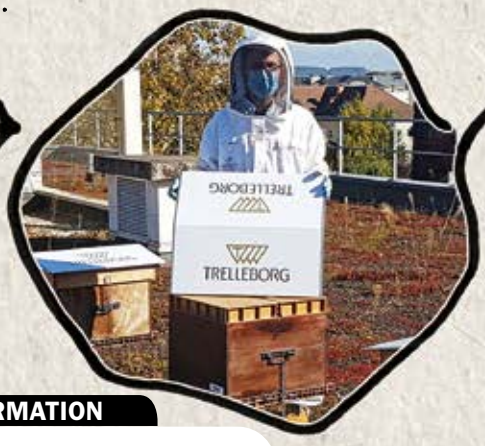
Protecting the Essential

We marked the end of 2021 by asking the Trelleborg family around the world to tell us about the things they do in their daily lives that help make the world a better place.

Here are just some ways our colleagues in Trelleborg Sealing Solutions are **#ProtectingtheEssential**

Keep chickens. They eliminate food waste, produce an excellent fertilizer, and supply fresh eggs!

Install beehives to improve biodiversity.



Shop locally and buy local organic produce to cut transport and lower our carbon footprint.

MORE INFORMATION

Scan the QR code to learn more about how Trelleborg is #ProtectingtheEssential

Make your own soap using ingredients you have at home, like fresh coffee grounds and essential oils.

Volunteer in the local community to clean-up the beach and help save the ocean.

Install solar panels to increase green energy

Create an indigenous tree nursery to protect our natural habitat.

"I work every day to protect the essential. One priority is our company's future by ensuring that we have talented employees in place, as well as innovative solutions for a sustainable society – such as a new generation of seals for electric vehicles or aircraft." **#ProtectingtheEssential**

PETER NILSSON,
CEO, Trelleborg

IN SHORT

1. Almost 1,000 participants joined 50 global speakers and panelists in a series of 37 industry focused sessions.
2. A panel discussion covered the challenges and solutions surrounding the transformation of manufacturing processes following the emergence of Industry 4.5.
3. Key themes included the evolving materials landscape, maximizing performance, meeting customer needs, creating added value, solving key industry challenges, energy efficiency and sustainable solutions.

Watch the Virtual Conference 2021
Recordings of the event resource downloads, videos and more are available at:
www.tss-virtualconference.com/recap/

VIRTUAL CONFERENCE 2021

The Future of Manufacturing

Trelleborg Sealing Solutions hosted its third successful Virtual Conference in 2021 with the theme “The Future of Manufacturing”, exploring current technical trends and their impact on transformation of manufacturing processes. We take a look at the day's sessions.

Over 50 industry experts from 20 locations shared their knowledge and expertise during a series of 37 sessions. Guest keynote speakers included:

Malte Volkwein, Head of the Corporate Strategy and Development Department, Fraunhofer IPA

Zhao-Toni Tong, Managing Director at Arburg China

Prof. Dr. Thomas Bauernhansl, Director, Fraunhofer Institute for Manufacturing Engineering and Automation

Fredrik Östbye, Group Vice President, Head of FutureLab, Grundfos

Welcome session (from left): Sarah Yvonne Elsser, Tech-Moderator and Trelleborg Sealing Solutions Management Team: Jürgen Bosch, Prof. Dr. Konrad Saur and Oliver Chan

On December 9, 2021, 50 global speakers and panelists took to the virtual stage to deliver a series of 37 industry-focused, in-depth sessions from 20 different locations.

Almost 1,000 participants from across Europe and Asia attended the online event, led by Trelleborg engineers, manufacturing experts and industry specialists. Highlights of the day included the opportunity to take virtual tours of some of Trelleborg's state-of-the-art manufacturing and R&D facilities in the US, Germany, Malta, and the UK.

Hosted by Sarah Yvonne Elsser, Tech-Moderator at Tech Well Told, and Prof. Dr. Konrad Saur, Vice President – Innovation and Technology at Trelleborg Sealing Solutions, the event was live streamed from the Trelleborg Sealing Solutions Innovation Center at the global headquarters in Stuttgart, Germany.

What segments did we cover and why?

Oliver Chan, BU President for APAC – "The world is changing fast. New technologies have shortened the time to evolve from one generation to the next. So, we see our life and business are really closely linked to this rapid change of technologies, like eMobility, hydrogen vehicles, robotics, nanometer chips, food safety or even higher customer demands and expectations."

What are your highlights of the day?

"Two things stood out for me. First was the panel discussion where key experts told us about future trends. That was quite amazing! Second were the breakout sessions - we shared so many interesting innovations and Trelleborg capabilities with the community."

JÜRGEN BOSCH, *BU President for Europe*

Advancing the 4th Industrial Revolution

Headlined by a keynote and panel discussion – Advancing the 4th Industrial Revolution – that included four guest speakers, alongside Prof. Dr. Konrad Saur. The discussion covered the challenges and solutions surrounding the transformation of manufacturing processes following the emergence of Industry 4.5, as priorities shift to sustainability, speed-to-market, and supply chain resilience.

Prof. Dr. Konrad Saur explains – "I believe the traditional way of thinking about business is changing. We heard from the keynote speakers, as well as from our other experts, that the future lies in partnerships, in breakthrough innovations and in sustainability. These call for innovative solutions. We can't simply carry on as we have for the last 200 years.

"There is a super mega trend out there toward individualization along with custom-made solutions and new business models. Radical innovation may lie in the fact that we are no longer selling products, but services."

Key themes

Key themes running through all the presentations included the evolving materials landscape, maximizing performance and meeting customer needs, creating added value for our customers, solving key industry challenges, energy efficiency and sustainable solutions.

"In the future, we see that new technologies will allow greater design freedom, products to reach the market faster and better match production to demand. Overriding everything, of course, is the desire to operate sustainably and explore how advanced processing can make this possible."

PROF. DR. KONRAD SAUR, *Vice President – Innovation & Technology at Trelleborg Sealing Solutions*

Panel discussion about the Future of Manufacturing, (from left):
Sarah Yvonne Elsser, Malte Volkwein, Prof. Dr. Konrad Saur, Fredrik Östbye, Zhao-Toni Tong

Live tour and insights into Trelleborg Sealing Solutions R&D Capabilities by Prof. Dr. Konrad Saur and Sarah Yvonne Elsser

Manufacturing and R&D capabilities

Several locations provided a behind-the-scenes look at R&D and manufacturing facilities, showcasing how sealing technology and materials are developed and tested to ensure they meet performance requirements.

With increasing demands on seals in many industries, multicomponent technology provides the perfect solution when a single component no longer fits the bill. A virtual tour of the multicomponent development center and manufacturing facility demonstrated first-hand how we test bonding strength and manufacture high quality, high volume multicomponent solutions.

The conference also gave customers the chance to see first-hand how our advanced composite products are produced, with technical experts answering questions like 'What makes advanced composites unique?'; 'What benefits do they offer?' and 'When does it make sense to consider advanced composites for equipment or an application?'

"There is a drive for micromolding, and multicomponent has not escaped this. We have special tools and machines to be able to make microparts for multicomponents as we understand the importance of this trend.

"Whatever your material combination, Trelleborg will have a solution. We have sites around the world to support your individual application requirements."

NEAL BORG, *Product Manager*

Neal Borg, Product Manager at Trelleborg Sealing Solutions in Malta, offers an inside look into multicomponent manufacturing technology.

Reid Hislop, Product Manager at the Trelleborg Sealing Solutions facility in Albany, US, explains how to empower the world with advanced composites.

Segment focus

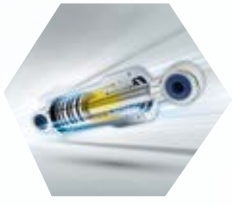
Automotive, Trucks & Transportation

eMobility is the biggest revolution in the automotive industry in recent decades. Manufacturers and their component suppliers rely on innovative and robust sealing technology to meet their demanding high-volume requirements.

Talks focused on:
- The future is now – eMobility
- Evolving material landscape – why new compounds are necessary
- Multicomponent technology – adding value for customers
- Optimizing the performance of high-speed e-Axles
- Enjoy the silence – eliminating vibration

"Electrification is a change. And change means chances. The future is now, and we are all part of it."

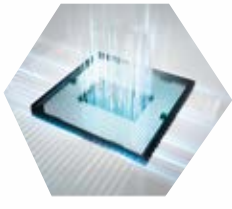
AXEL WEIMANN, *Director Global Segment Automotive, Trucks & Transportation*



Fluid Power

At the forefront of sealing technology, innovations, such as Lubrication Management maximize the lifetime of hydraulic systems and of fluid power components, ensuring reliable, long-lasting operation.

Talks focused on:
- Meeting customer needs in the fluid power industry
- The Orkot® Slydring® family – a solution for every system
- Nexus 2.0. – the new line of face seals
- Maximizing the performance of hydraulic systems



Semicon

Rapidly evolving technology, promising huge growth, drives semiconductor manufacturers' innovation. Specially engineered sealing materials help reduce total cost of ownership and accelerate time to market.

Talks focused on:
- Serving the semiconductor industry as a solutions provider
- Isolast® PureFab™ FFKM for advanced semiconductor processes
- Advanced manufacturing capabilities to meet customer needs

Drives and Motion

Automation and sustainability are propelling innovation in drives and motion control technology. State-of-the-art sealing solutions are custom-designed to meet the requirements of cutting-edge applications.

Talks focused on:
- Global but local – solutions for the robotics industry
- Radial oil seals in focus
- Sealing innovations for robotic equipment
- Maximizing the performance of hydraulic systems

Food & Beverage Processing

Optimizing production, enhancing efficiency, and meeting the highest quality and food safety requirements are critical. High-performance sealing materials keep even the most challenging applications running.

Talks focused on:
- Trelleborg's commitment to food & beverage processing
- Food contact regulations – how to ensure compliance
- FoodPro® materials ensure safe sealing in food processing
- CO_2 capture – cheers to a sustainable beer

PROTECTING THE ESSENTIAL

Sustainability

An important theme at the Virtual Conference was 'Protecting the Essential' through sustainability improvements, which are key to our future. Trelleborg's sustainability work focuses on areas that create long-term value for our customers, improve product performance and support the creation of a circular economy.

Talks included:

- Sustainable material and product solutions: How the flow of materials can be improved along the production chain, and how we can move toward a circular economy.
- Sealing challenges of the future: Hydrogen is key in the global efforts to reduce emissions. Sealing the smallest gas molecule of the universe is challenging, but not impossible.
- Environmentally friendly & energy efficient applications: How we help our customers become more environmentally friendly and sustainable.
- Reducing the challenge of friction with innovative surface treatments: We analyze different root causes and compare options to minimize friction and reduce energy usage.

> "Whatever we do in our manufacturing facilities and whatever we buy will not cause additional greenhouse gas emissions. That's what we mean by net zero."

PROF. DR. KONRAD SAUR

MORE INFORMATION

Find out more about our vision to be carbon neutral by 2035 in Trelleborg Group's latest Sustainability Report.

Download the report →

INDUSTRY INSIGHTS

At the Virtual Conference visitors could interact via polls or use the chat function on the new online event platform.

34% of respondents said that adoption of digital solutions in manufacturing processes is a key challenge in transforming their processes.

65% of respondents agreed that sustainability should be considered in the future of manufacturing.

24% of respondents said that sustainable solutions and zero emissions are key priorities for the future.

Online Shopping

The last two years have been very challenging. Covid-19 affected every corner of the planet and, alongside health precautions and risks, everyone had to find new ways to communicate and work together.

By Kostas Kosmidis

TO ENSURE CONTINUOUS GROWTH, companies around the globe are prioritizing digital transformation. As a result of this, the importance of eCommerce in business-to-business (B2B) relations is increasing.

Fast and easy procurement

One vital role of a B2B eCommerce platform is its ability to provide existing customers with an additional channel to independently order goods and manage their stock without the need for personal interaction. In the pandemic, this offered health and safety benefits, but for the long term it is an effective and convenient way to do business.

> "Due to the continuous development of the online store and the growth of eCommerce in B2B, the turnover in the Seals-Shop has tripled since 2020"

CHRISTIAN PACHUR,
Manager Distribution & Online Sales, Channel Management Distribution Europe at Trelleborg Sealing Solutions

While B2B eCommerce growth is not comparable to business-to-consumer (B2C) growth, it does follow the same trends. Both sellers and buyers see a positive impact coming from digitalization.

With its Seals-Shop offering, Trelleborg Sealing Solutions gives customers in different locations and industries an online solution for fast and easy procurement of high-performance solutions. Products ship directly from Trelleborg's Logistics Centers, ensuring quick delivery.

An expanding portfolio

Developed six years ago, the Industrial Seals-Shop gives European customers an additional way to purchase seals alongside the traditional channels. In the shop, they have access to their product portfolio, including customized parts, as well as individual pricing and payment conditions. →

ACCOMPANYING THE DIGITAL CUSTOMER JOURNEY

We are starting to see a broad shift in how we interact with technology, toward something referred to as the metaverse, a network of 3D virtual worlds focused on social connection. Research company, Gartner, anticipates that by 2026, 25% of people will spend at least one hour a day in the Metaverse for work, shopping, education, social media and/or entertainment.[1]

[1] https://www.gartner.com/en/newsroom/press-releases/2022-02-07-gartner-predicts-25-percent-of-people-will-spend-at-least-one-hour-per-day-in-the-metaverse-by-2026

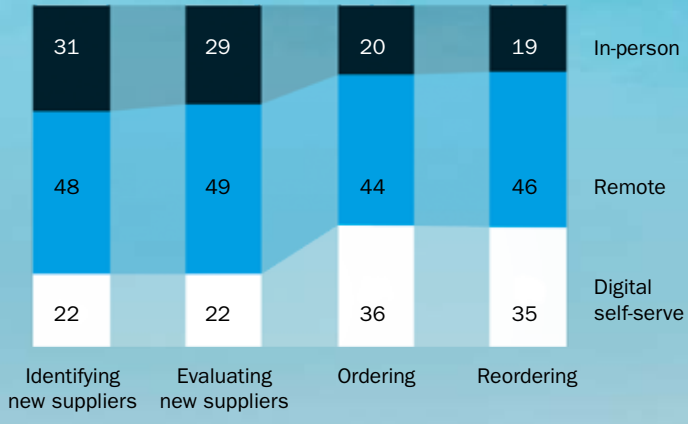
[2] % of respondents

[3] Figures may not sum to 100% because of rounding.

Source: https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/these-eight-charts-show-how-covid-19-has-changed-b2b-sales-forever

Most B2B seller interactions have moved to remote or digital ...

"How would you currently interact with sales reps from your company's suppliers during the following stages of interactions?" [2,3]



The latest release, a new Custom Seal Selector, gives users the ability to order standard seals in custom dimensions to meet unique application needs. The tool offers a wide selection of industry-standard sealing profiles for static and linear applications. These can combine with a variety of different Zurcon® engineered plastic and elastomer materials.

Christian Pachur, Manager Distribution & Online Sales, Channel Management Distribution Europe at Trelleborg Sealing Solutions, has witnessed the value of eCommerce firsthand. "Due to the continuous development of the online store and the growth of eCommerce in B2B, the turnover in the Seals-Shop has tripled since 2020.

“Last year we launched the Marine Seals-Shop to meet the specific needs of the shipping and marine industry. Integrated within the existing store, the Marine Seals-Shop expands the portfolio, giving customers access to a full range of Orkot® composite bearings. The next store updates will expand the product portfolio even more, integrate new online services and further improve the user experience!"

Development by region and country

For North American customers, a couple of industry-specific shops provide 24/7 self-service for manufacturing and maintenance, repair and operations (MRO) customers.

In 2020, the Chemical Transportation Seals-Shop launched, enabling customers to purchase repair kits and individual components for valves and other applications critical to the function of chemical transport tank cars, trucks and ISO containers. Following this was the Fluid Power Seals-Shop, which simplifies the procurement process by facilitating online ordering of O-Rings and standard sealing solutions for hydraulic applications.

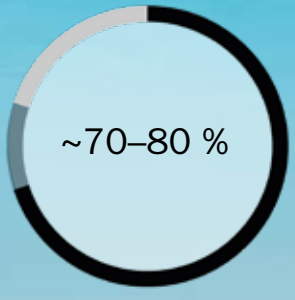
In 2020, Trelleborg Sealing Solutions launched a self-service portal for customers in India, which, in its first phase, serves a selected set of 80 existing customers. The portal, which was almost six months in the making, meets the specific needs of the Indian market and the customers registered to the platform, who now conduct all their business online.

> “We see the self-service portal as an extension of our services toward customers, alongside more traditional ordering formats.”

ROHIT NAIR,
Head of Marketing & Communications for Trelleborg Sealing Solutions in India

... and that's exactly what customers want.

"How would you prefer to interact with sales reps from your company's suppliers during the following stages of interactions?"



~70–80 % of B2B decision makers prefer remote human interactions or digital self-service[3]

Why?
- Ease of scheduling
- Savings on travel expenses
- Safety

Rohit Nair, Head of Marketing & Communications for Trelleborg Sealing Solutions in India, explains the idea behind their portal: “We see the self-service portal as an extension of our services toward customers, alongside more traditional ordering formats. The fully automated order to dispatch streamlines internal processes and gives us the ability to scale up use of the platform in the future.

“After receiving positive feedback from customers, we’re planning to expand use of the portal to customers in other regions and in other industries. As a second step, we want to further develop the platform to handle new inquiries and processes, connecting it to existing lead management processes. While the eCommerce journey for India has only just begun, we are very excited to follow its growth.”

Accompanying the digital customer journey

B2B eCommerce will play a vital role in the digital transformation of more and more companies. The ability to operate in a virtual environment, reduces costs, while offering sellers and buyers a new channel to easily conduct business. Integration of Product Information Management (PIM), Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) systems, is crucial to providing customers with the best service possible and maximizing business benefits.

With its set of eCommerce portals for customers in different regions across the globe, Trelleborg Sealing Solutions has laid a good foundation for continuous innovation accompanying and enabling the customer in their digital journey.

NEW FLUID POWER SEALS-SHOP

In December 2021, Trelleborg Sealing Solutions launched the Fluid Power Seals-Shop. Available to customers in North America, the Seals-Shop is an online solution for fast and easy procurement of high-performance seals and wear rings critical to the function of hydraulic components in fluid power applications.

The 24/7 self-service platform for manufacturing and maintenance, repair, and operations (MRO) customers, enables them to place orders for a wide range of standard products, such as rod and piston seals, scrapers, wear rings, and AS568 O-Rings. Products ship directly from Trelleborg’s Logistics Centers, ensuring quick delivery. Customers can easily search for products and access their invoice payment, order history, and shipment tracking, all from the Seals-Shop.

Michael Cook, Global Segment Director, Off-Highway and Marketing Americas Segment Manager, Fluid Power, says: “Quality Trelleborg seals for a variety of hydraulic components are in stock and ready to ship using the Seals-Shop. With the many challenges manufacturing and MRO customers face today, this self-service ordering platform saves valuable time, so they can focus on the things that matter most to their business.”

Shop online for seals now: https://www.fluidpowersealsshop.com

Multicomponent Technology

Engineered One-piece Solutions for Integrated Functionality now

Improve performance and consolidate multiple functions with a single engineered component.

Trelleborg's multicomponent technology strongly bonds a range of high-specification polymers, chosen to meet your specific application requirements. Customizable seal geometries combine multiple features or seals to improve performance, ease assembly and reduce part handling. The seals produced are leak-free and need less space and assembly effort, making them a cost-effective sealing solution.

Scan the QR code to learn more about this technology.

TRELLEBORG