

The Magazine from Trelleborg Sealing Solutions

in the groove

The world of seals and service



Read *in the groove*
online

AUTOMOTIVE

On the Fast Track

Supporting the transition to 100% sustainable fuel.

PRODUCT FOCUS

Flat Solutions

The HMF FlatSeal™ range stands up to the most demanding of applications.



AEROSPACE

Flying into the Future

Urban Air Mobility (UAM) is revolutionizing the way we travel.



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EVENT



Innovation Day Europe

Accelerate Your Business Now



Meeting the emerging demands of a constantly changing world with a focus on sustainability is reshaping the industrial environment. On October 11, customers were invited to join inspirational keynote speakers, lively panel discussions and technical presentations, either in person at the Wagenhallen in Stuttgart, Germany, or digitally.

The event aimed to educate attendees on industry trends, manufacturing insights and sealing and polymer technology as well as customized solutions to improve their business and accelerate their performance.

Session topics revolved around three key themes: Advanced Technologies, Manufacturing Capabilities and Customized Solutions. These included innovative technologies, such as multicomponent manufacturing and LSR processing, leading-edge materials, including composite technologies and Isolast® FFKM, and comprehensive services to optimize the whole value chain.



Scan the QR code to watch the recordings and see pictures of the event.
tss-innovationdays.com/innovation-days-eu

SPONSORSHIP



Trelleborg Sponsors the NFPA's Pascal Society

Trelleborg's Fluid Power operation in the US donated to the educational organization of the National Fluid Power Association (NFPA).



Named after Blaise Pascal, the French mathematician, physicist, and inventor, the NFPA's Pascal Society seeks to develop the resources, tools, and people needed to tackle workforce development challenges in the US fluid power industry.

Thanks to the generosity and efforts of companies like Trelleborg, the NFPA Foundation's workforce development initiatives have impacted thousands of students at all grade levels across the country.

By being a Pascal Society donor, Trelleborg can meet, coach, and mentor students, judge undergraduate fluid power competitions, and attend exclusive career fairs and events to help students improve their resumes and interview skills.

Trelleborg makes its voice heard by serving on the Pascal Society Council to help shape the education and marketing programs that bring fluid power to students and prepare them for careers in the industry.



Scan the QR code to learn more.
nfpafoundation.org

R&D CAPABILITIES



New R&D Services in Bengaluru, India



Trelleborg Sealing Solutions has opened its 10th R&D Center to provide closer testing and qualification for its APAC customers.

Its functions include custom product engineering, technical document management and material compliance evaluation, with plans to bring it fully in line with the service provision of the other R&D facilities.

Trelleborg Sealing Solutions has testing and development services situated across the globe, managing over 2,000 unique material formulations, engineering custom-designed solutions, and overseeing proprietary products, such as Stepseal®, Variseal® and Wills Rings®.

ACQUISITION



Trelleborg Acquires EirMed LLC.



On April 25, 2022, Trelleborg Group, through its business area Trelleborg Sealing Solutions, signed an agreement and finalized the acquisition of the US-based company EirMed LLC. Based in Menomonie, Wisconsin, the company specializes in technical precision plastic injection-molded components, which are mainly applied in medical devices, such as those used for in-vitro diagnostics, minimally invasive surgery, and orthopedics.

The acquisition furthers Trelleborg's ambition to be the partner of choice for medical device manufacturers, providing all materials, components and processes needed to deliver finished devices to market. EirMed enables Trelleborg to enter markets where it previously had no presence, specifically the bioresorbable and dental markets.

IMPRINT

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p. 53;54;55 Trelleborg Sealing Solutions

Experience our Capabilities

Our teams of experts are hosting online webinars and visiting trade shows across the globe to give you a closer look at the broad range of products, solutions and services that we offer.

HMF FlatSeal™ Gaskets – Boost Flange Sealing Performance Now

WEBINAR



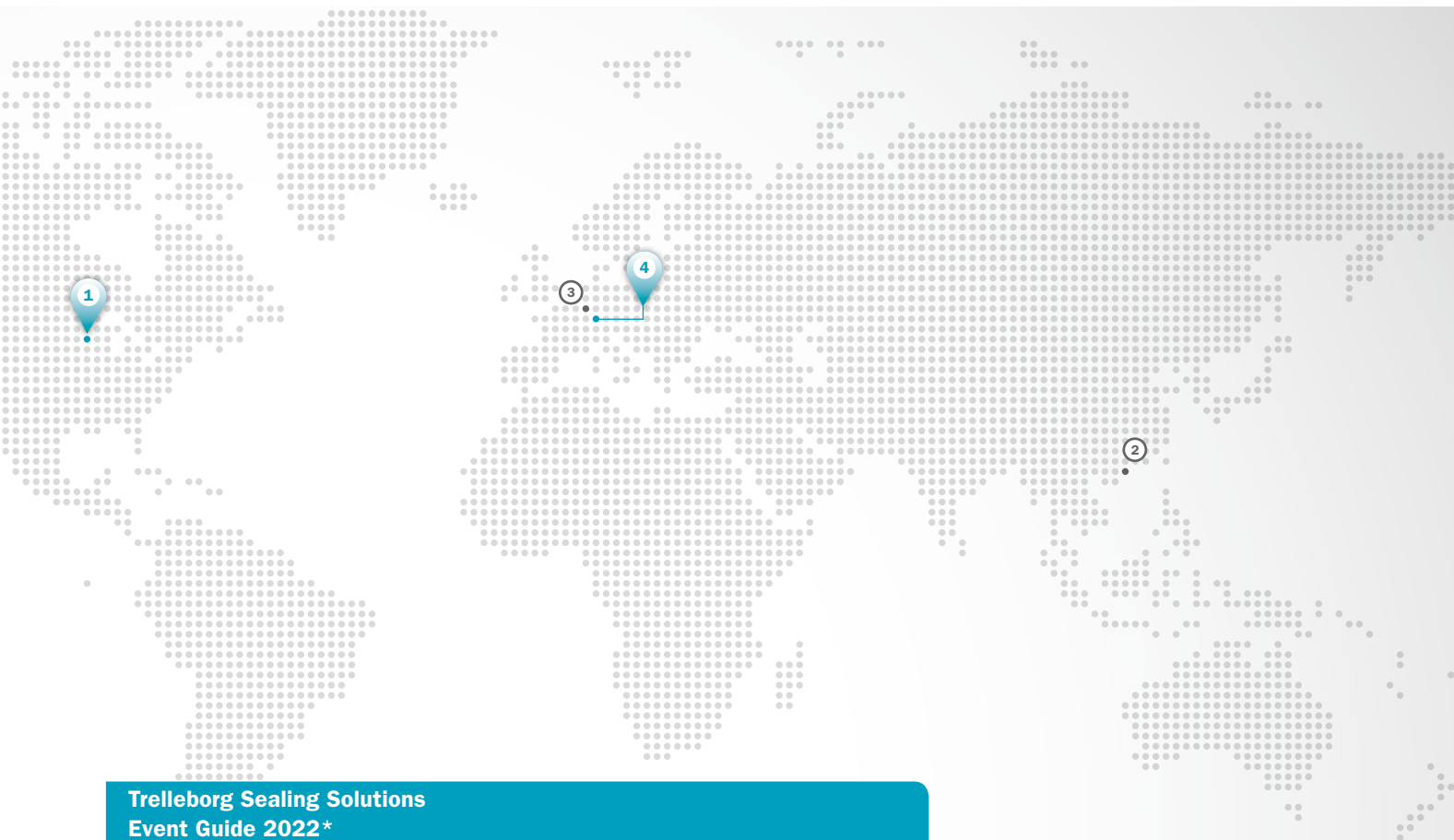
Our comprehensive portfolio of best-in-class flat gaskets is designed to meet all flat sealing needs. These high-performance materials are suitable for the widest range of temperatures and pressures and are compatible with virtually all chemicals. The new range of HMF FlatSeal™ flat gasket materials includes specialist materials for use with harsh chemicals and media in many different industries.

D-Seal – Combined Sealing and Damping to Prevent Cylinder Damage

WEBINAR



Vibrations from diesel engines in heavy trucks can cause cavitation damage to cylinder linings, tube fittings and flange seals, reducing efficiency and eventually leading to failure. D-Seal is an innovative new product from Trelleborg Sealing Solutions, custom engineered specifically to both eliminate cavitation damage and improve performance in critical truck engine and transmission applications.



Trelleborg Sealing Solutions Event Guide 2022*

HMF FlatSeal™ Gaskets	WEBINAR	Online	Oct 20
D-Seal	WEBINAR	Online	Oct 27
MD&M Minneapolis	①	Minneapolis, Minnesota, US	Nov 2 – 3
Zhuhai Airshow	②	Zhuhai, China	Nov 8 – 13
Compamed	③	Düsseldorf, Germany	Nov 14 – 17
Semicon Europa	④	Munich, Germany	Nov 15 – 18



* The most current version of the Trelleborg Sealing Solutions event calendar can be found at www.tss.trelleborg.com/fairs

Healthcare & Medical MD&M Minneapolis

①

Medtech moves fast... especially in a healthcare hub like Minnesota. Keep the pace with the latest innovations and immerse yourself in a community of visionaries and industry leaders. It's all waiting at the region's most comprehensive medical design and manufacturing event — MD&M Minneapolis — part of Advanced Manufacturing Minneapolis.



Semiconductor Semicon Europa

④

SEMICON Europa 2022 is co-located with electronica in Munich, Germany creating the strongest single event for electronics manufacturing in Europe and broadening the range of attendees across the electronics chain.



Digital Update

Trelleborg Sealing Solutions offers a wide variety of e-tools and services for engineering and industrial use. Find reference materials, interactive web tools and apps, learning resources and more, all designed to support the design engineer in their daily work.

WEBSITE UPDATE In Your Language

The Trelleborg Sealing Solutions website has now been translated into Vietnamese, providing seals and service in 20 different languages!

The Trelleborg Healthcare & Medical website is now available in four more languages: Korean and Japanese, as well as simplified and traditional Chinese.



DIGITAL SERVICE Virtual Showroom

Take a virtual tour of our products and solutions and immerse yourself in innovative sealing technology.

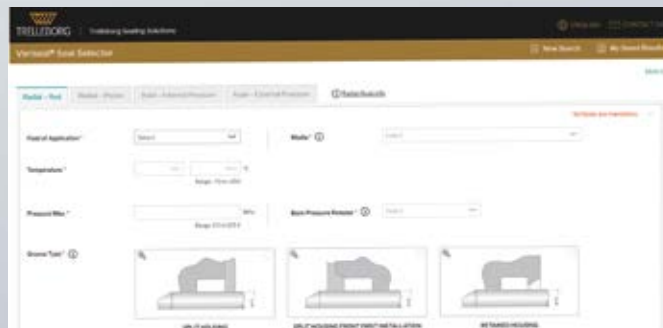
→ Find out more on page 42.



E-TOOLS Variseal® Oil & Gas Seal Selector Tool

Quickly and easily create standard or custom seal proposal documents for the Variseal® Range of spring-energized lip seals for Oil & Gas applications.

→ Find out more on page 14.



Americas Virtual Conference 2022: The Future of Manufacturing – Recordings Now Available!

Following the success of our recent Americas Virtual Conference, recordings of the panels have been made available online. Customers were invited to join Trelleborg Sealing Solutions experts and learn about the future of manufacturing with a series of conversations and panels. The discussions revolved around four important topics: digital transformation, circular products, localized production/near sourcing and sustainability:

Digital Transformation – The digital transformation trend continues to shape how companies operate, regardless of their industry. Uwe Hähnel, Tim von der Bey, and Kyle Kipfer take turns highlighting different aspects of this trend and discussing how Trelleborg is staying at the leading edge. Will Bacon follows this up by sharing information about Trelleborg's wireless automated replenishment system – Intellistok®.

Circular Products – The circular economy references methodologies by which people and companies can reduce waste through the careful application of design thinking. Product design focuses on re-use, refurbishment, and waste reduction. David Kaley and Michael Cook review the circular product concept, share examples, and discuss how seal design can be included in your design thinking for circularity.

Localized Production / Near Sourcing – Manufacturers are looking to localize production and near-source to mitigate risk. In this session, you'll learn how Trelleborg's ServicePLUS Centers help our customers operate more efficiently, improve working capital, and increase speed to market.

Sustainability – The push to further efforts around sustainability is causing companies and individuals to rethink how they operate. Dr. Konrad Sauer discusses how Trelleborg supports customers on their sustainability journey without compromising product performance and reliability.



Visit the website to view recordings of the panels and photos of the event:
americas.tss-virtualconference.com



The presenters and panelists at the Americas Virtual Conference 2022.

HAVE YOU LISTENED TO OUR PODCASTS?

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, such as digitalization, electrification and sustainability.



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

NEW LITERATURE

Find out more about our solutions in these new brochures and flyers.



Urban Air Mobility

Urban Air Mobility is a rapidly developing industry, providing safe and efficient forms of air transport. Based on its vast experience in aerospace and eMobility applications, Trelleborg Sealing Solutions offers proven products for the whole vehicle.

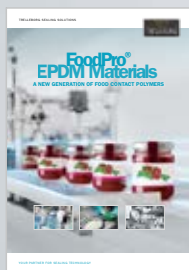
➔ Find out more on page 11.



Engineered Performance Polymer Solutions

Trelleborg Sealing Solutions offers custom thermoplastic materials and products to meet specific customer application requirements. Innovative manufacturing processes enable smaller and more complex geometries, reducing size and weight, and combining functions.

➔ Find out more on page 44.



FoodPro® EPDM Materials

Specially engineered for use in food and beverage processing applications, FoodPro® EPDMs are compliant with the most comprehensive global food contact material regulations.

➔ Find out more on page 51.



D-Seal

A new seal combines sealing and damping in a new design to eliminate cavitation damage in diesel engines and transmissions. D-Seal protects cylinder liner applications and gives long-lasting, leak-free performance.

➔ Find out more on page 54.



MORE INFORMATION



Our catalogs are frequently updated with our latest innovative products and solutions. You can find all of our catalogs, brochures and flyers online at trelleborg.com/seals/literature or scan the QR code.



WHITEPAPER: Introducing APIs to Silicone and Controlling Elution Rates

Drug-eluting devices and solid implant drug delivery platforms have seen a heavy focus in development of new therapies. This whitepaper reviews the methods for introducing an active pharmaceutical ingredient to raw silicone and explores a new means of controlling long-term elution rates.

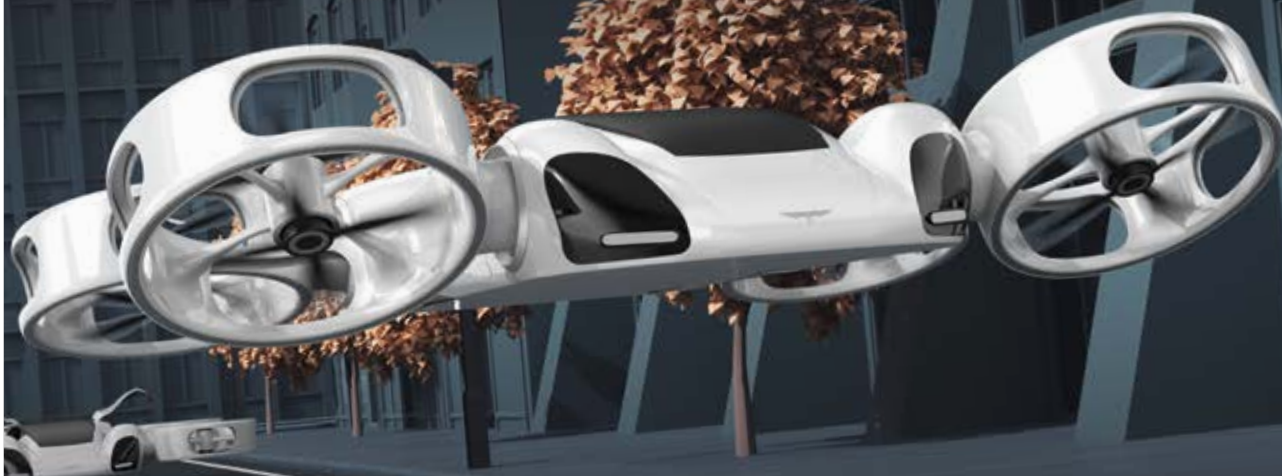


Scan the QR code
to find out more

Flying into the Future

UAM will revolutionize the way we travel. This rapidly evolving industry is developing safe, efficient and sustainable forms of air transportation that cover everything from package delivery drones to passenger-carrying air taxis.

By Meghan Cloud Braunger



URBAN AIR MOBILITY (UAM) WILL REDUCE THE NEED FOR INDIVIDUALLY OWNED CARS,

cutting down on traffic. This will benefit the environment, not only because of the green energy used, but also indirectly through the impact it has on infrastructure.

Innovative Polymer Technology for the Whole Vehicle

Though sometimes perceived as 'just' a flying car, these vehicles face several challenges and must fly safely in all kinds of weather.

Based on decades of experience in sealing, damping and protecting aerospace, eMobility and industrial applications, we offer a wide range of sealing and polymer components optimized to work in severe weather, extreme temperatures and that are compatible with aggressive chemicals. →

UAM ENGINEERING SPONSORSHIP PROGRAM

To develop innovative solutions for UAM vehicles, Trelleborg Sealing Solutions Aerospace is partnering with manufacturers to sponsor projects in the areas of sealing, damping and protecting. Related to polymer and composite components, the sponsorship covers development costs, FEA support, tooling and prototypes.

Scan the QR code to find out more



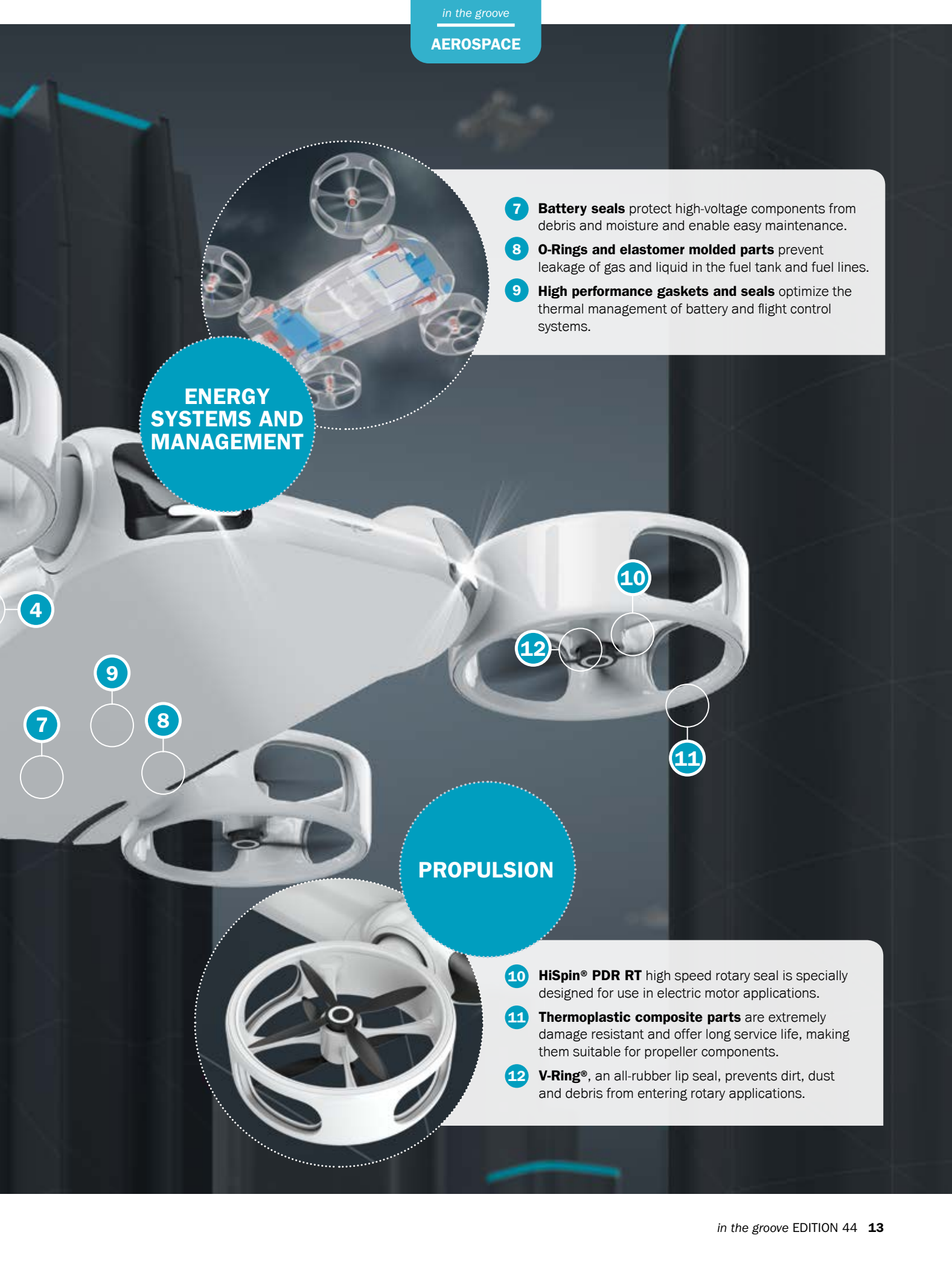
Innovative Polymer Technology for the Whole Vehicle

- 1 **Extruded profiles**, used as seat track covers, bump strips and for wire and cable management, cover gaps while improving aesthetics and passenger safety.
- 2 **Injection molded thermoplastic parts**, in any shape and size imaginable, can be used as air nozzles, panels and bracket components.
- 3 **Orkot® and HiMod® Bearings**, ideal for use in storage bins, are lightweight and resistant to heavy loads.

CABINS AND INTERIORS

- 4 **Airframe seals** are used for aerodynamic sealing of doors, windows, canopies, hatches and panels.
- 5 **Advanced composite technology** is used to manufacture structural components, which are recyclable, lightweight and very tough.
- 6 **Custom elastomer parts** protect movable joints and are engineered for high flexibility and long life.

AIRFRAMES AND STRUCTURES



ENERGY SYSTEMS AND MANAGEMENT

- 7 Battery seals** protect high-voltage components from debris and moisture and enable easy maintenance.
- 8 O-Rings and elastomer molded parts** prevent leakage of gas and liquid in the fuel tank and fuel lines.
- 9 High performance gaskets and seals** optimize the thermal management of battery and flight control systems.

PROPULSION

- 10 HiSpin® PDR RT** high speed rotary seal is specially designed for use in electric motor applications.
- 11 Thermoplastic composite parts** are extremely damage resistant and offer long service life, making them suitable for propeller components.
- 12 V-Ring®**, an all-rubber lip seal, prevents dirt, dust and debris from entering rotary applications.

Variseal® Oil & Gas Seal Selector

Our latest online configuration tool offers a unique design service that lets you quickly and easily create standard or custom seal proposal documents for our Variseal® range of spring energized lip seals. Specifically designed for use in seal design for oil, gas & energy applications, the online tool provides recommended results immediately, to save you time.

By Sophie Hudson

Choose the Right Seal, Everytime


Traditionally, seal designs for oil & gas applications are based on a variety of factors. These need specialized knowledge to interpret them correctly and without the right training, can lead to the incorrect specification of seals. This then requires additional time and resource to identify and correct issues, as well as to re-select the correct seal for the application. The Variseal® Oil & Gas Seal Selector walks a user through the design and selection process to provide the right seal design, material, and type for their application.

Easy to Use

Available on the Trelleborg Sealing Solutions website, the interactive Variseal® Oil & Gas Seal Selector provides a range of sealing options including radial rod, radial piston, axial internal pressure and axial external pressure. Simply select your options from application, media, temperature and pressure to groove and design type, and input the required information to instantly see a recommended solution for your application. You can save the results, send the results via email, or download the results as a PDF to share with colleagues outside of the tool. Seal designs or dimensions can be adjusted without the need to repeat the option selection, with instantly revised results to provide ultimate flexibility within the design process.

Designed for the Oil & Gas Industry

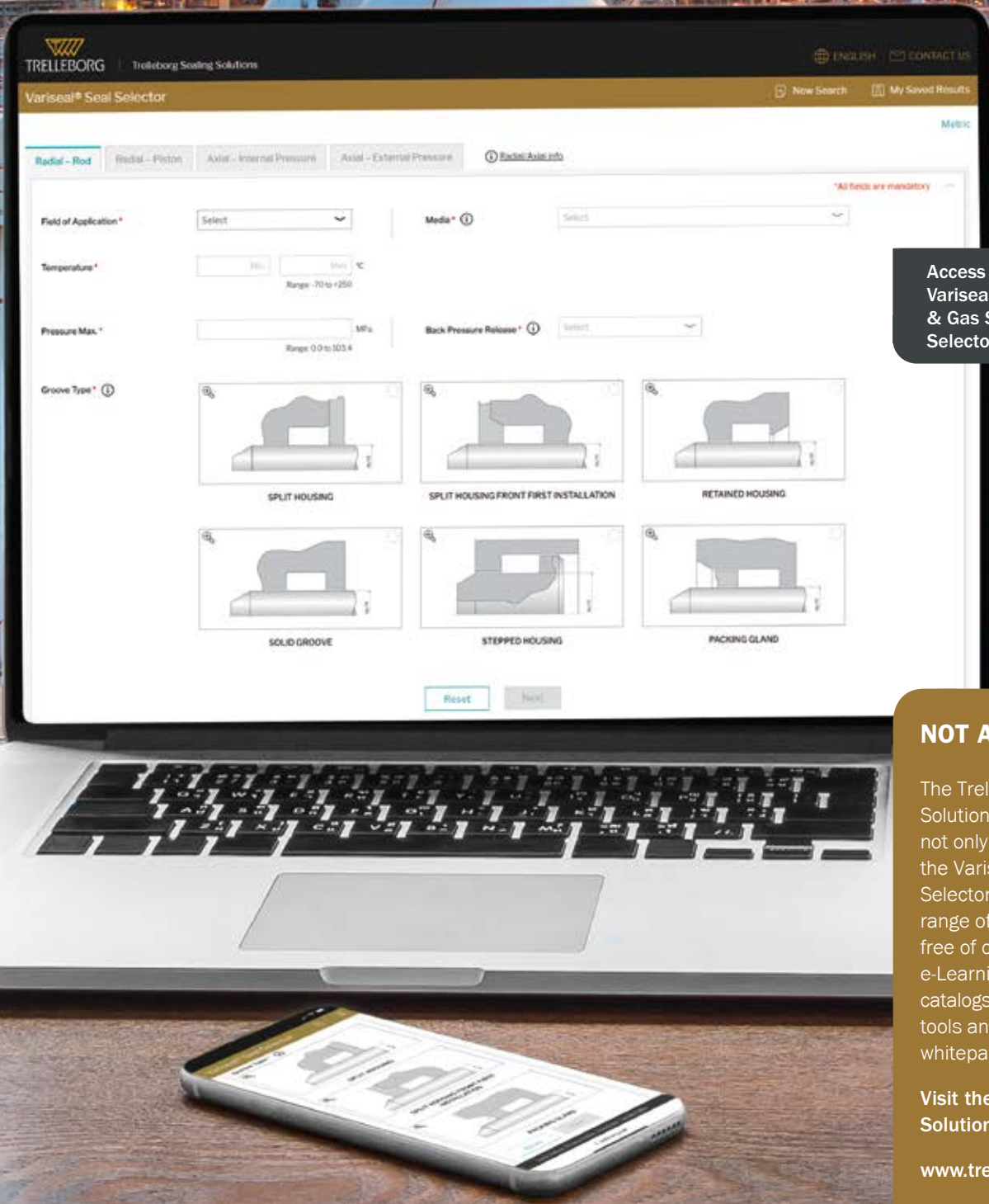
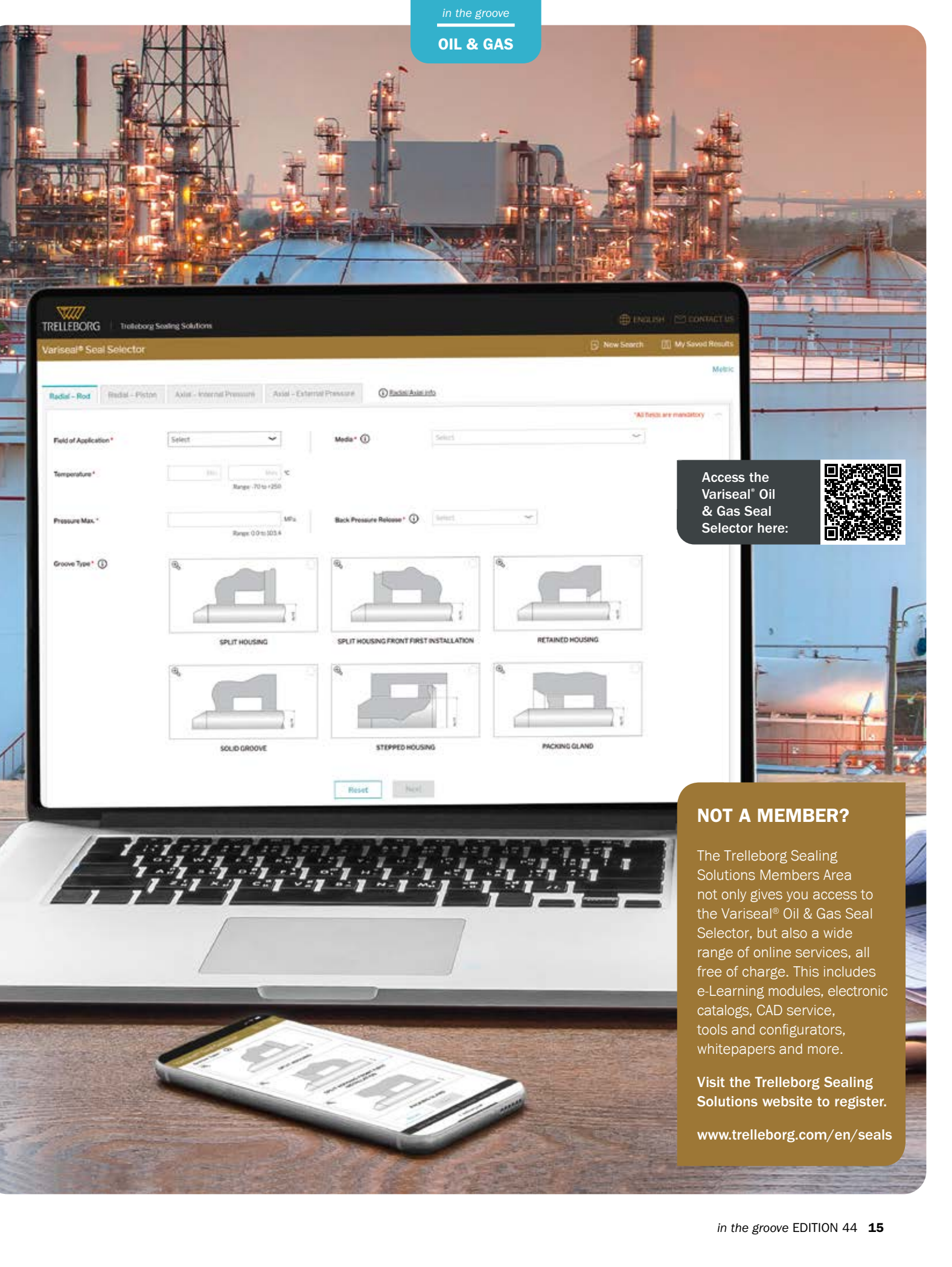
The tool is designed specifically for use in oil & gas applications, for example in gate and ball valve design, where complex designs need to meet the challenging conditions experienced by original equipment manufacturers. Users can create and save a custom profile that contains key application parameters, preferred hardware options, and design options for the stem, seat, and bonnet positions on each valve with hardware drawings completed and evaluated at the same time. This is even when multiple designs or products are considered.

Available in English, with metric system measurements, Trelleborg's Variseal® Oil & Gas Seal Selector will benefit from the addition of further information during 2022, including test results and regular updates. The tool is suitable for use with a wide range of oil, gas & energy applications including gate, ball and check valves, connectors, and downhole tools. 

“We want to make it as easy as possible for our customers to produce a number of seal design requests quickly. The Variseal® Oil & Gas Seal Selector is a unique design engineering service created with customers in mind. The online platform allows users to view and download the sealing solutions they need, without utilizing multiple engineering resources, saving them time and providing results immediately.”

JAMES SIMPSON,
Global Segment Director
Oil & Gas and Energy at
Trelleborg Sealing Solutions





Trelleborg Sealing Solutions

ENGLISH | CONTACT US

Variseal® Seal Selector

New Search | My Saved Results

Metric

Radial - Rod | Radial - Piston | Axial - Internal Pressure | Axial - External Pressure | Back/Axial Info

*All fields are mandatory

Field of Application*
Select

Media*
Select

Temperature*
Min. Max. °C
Range: -70 to +250

Pressure Max.*
MPa
Range: 0.0 to 103.4

Back Pressure Release*
Select

Groove Type*

SPLIT HOUSING

SPLIT HOUSING FRONT FIRST INSTALLATION

RETAINED HOUSING

SOLID GROOVE

STEPPED HOUSING

PACKING GLAND

Reset | Next

Access the Variseal® Oil & Gas Seal Selector here:

NOT A MEMBER?

The Trelleborg Sealing Solutions Members Area not only gives you access to the Variseal® Oil & Gas Seal Selector, but also a wide range of online services, all free of charge. This includes e-Learning modules, electronic catalogs, CAD service, tools and configurators, whitepapers and more.

Visit the Trelleborg Sealing Solutions website to register.

www.trelleborg.com/en/seals



On the Fast Track

Formula One is one of the most popular motorsports in the world. Ten racing teams compete to be crowned champions with cutting-edge car design at the very center of the sport.

By Sophie Hudson

AMUL PATEL,
General Manager,
Race-Tec, UK



WE TALK TO AMUL PATEL, GENERAL MANAGER, AND PAUL BRAIN, Engineering Manager at UK-based Race-Tec, part of Trelleborg Sealing Solutions, to find out more about how seals are pushing performance boundaries in F1.

Technological Evolution

To promote economic and sporting sustainability in Formula One, the F1 and world motorsport governing body, the Federation International de l'Automobile (FIA), founded in 1904, sets the technical regulations for race teams, including car dimensions and size, weight, use of biofuel, and spend caps.

Over its 72-year history, the landscape in F1 has changed. "Race teams each run two cars per season, whereas in the past they ran separate race and test cars in parallel, building around 350 engines per team," says Amul. "Each team is now limited to just three engines per season, with components and parts required to provide high-performance over a much longer time period. →

PAUL BRAIN,
Engineering Manager,
Race-Tec, UK



MOTORSPORT SEALING SOLUTIONS

Each F1 car will contain more than 70 sealing solutions. Take a look to see where our sealing technology can be found.

HYDRAULICS & ACTUATORS

- DRS Actuator
- Clutch Actuator



Turcon Variseal

TRANSMISSION

- CV Driveshaft Boots
- Differential Output
- Layshaft
- AV Mount
- Separator/Baffle



AV Mounts

HYBRID POWERTRAIN

ELECTRICAL & ENERGY RECOVERY

- MGU-K Rotor Shaft
- Battery Vent seal
- Battery Cover Gasket



Gaskets



Ventseal Ventil

ICE

- Variable Length Trumpets
- Crankshaft
- Cylinder Head Gasket
- Water Pump
- Oil Pump



Water Pump Seal

TURBOCHARGER

- Wastegate Actuator

FUEL SYSTEM

- O-Rings Bootstrap Reservoir



O-Ring Seal Glide

For us, this means the seals we design must have a much longer lifespan. They need to last six races if not longer and are validated to last almost double this. Previously they would have had new seals for every race – this is a big change for the industry.”

Modern F1 cars are the most efficient they have ever been, with hybrid engines designed to deliver optimum performance. The turbocharged engines are augmented with a dual heat and kinetic energy recovery system, typically running at around 50,000 revolutions per minute. “The new hybrid engines create extremely hot conditions, and our seals must be able to withstand the heat and

temperature. We work closely with the designers and engineers to custom engineer a solution that meets the exact requirements of the team’s design,” says Paul.

A Winning Combination

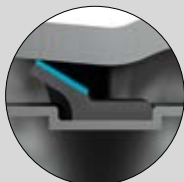
“Our customers rely on us to not only provide them with a custom solution designed to meet their requirements with pinpoint accuracy, but also to deliver that solution quickly. We must be agile to meet the demands of the industry where designs are continually enhanced and evolve, with parts often needed in time for testing at the next race just a couple of weeks later,” says Amul. “We work as an extension of the race team, delivering a high-quality

STEERING & SUSPENSION

- Suspension Damper
- Power Steering
- Hydraulic Accumulator



**Accumulator
Bladder**



Wheel Rim Seals



Bearing Seals

WHEELS & BRAKES

- Wheel Rim
- Brake Drum
- Wheel Bearings
- Braking System Hydraulics

service with minimal room for error. Everything we do is custom-made and made to order with no two designs the same."

The key requirements for sealing solutions in F1 applications are to reduce friction, reduce energy consumption, and increase efficiency, all with a view to improving the overall performance of the car. This means a high level of testing and analysis is required to ensure Race-Tec meets the needs of the customer. →

OUR SOLUTIONS



PL Technology

For high-performance applications, a hybrid PTFE elastomer seal is produced using PL Technology to form and chemically bond a layer of PTFE onto the seal lip.

This allows high surface speeds to be reached and significantly reduces power losses. PL Technology retains the inherent flexibility of the elastomer and combines this with the low friction performance of PTFE.



Custom Driveshaft CV Boots

Using FEA analysis and specialist material formulations, custom-designed driveshaft boots are engineered to meet the requirements of the car design. Innovations include significant weight reductions that are combined with shielding properties, to protect the CV joint in the driveshaft against high-velocity impact.



HiSpin® Rotary Seals

Designed for use in hybrid and electric vehicles, HiSpin® rotary seals enable the higher rotational speeds required for the e-axis to increase efficiency.

The HiSpin® PDR RT and HiSpin® HS40 seals provide seal integrity when running at high rotational speeds with minimum friction and minimum power loss.



Turcon® Wedgpak® – Slipper Seal

Our Turcon® Wedgpak® consists of a proprietary triangular elastomer sealing element, supported by two delta-shaped Back-up Rings that prevent the elastomer sealing element from spiraling or rolling under severe conditions. The unique Wedgpak® design provides slipper seal type performance with low static and dynamic friction and excellent leakage control.



Collaborative Approach

Working up front, at the design stage, our engineers work in partnership with each customer to collaborate and develop solutions. “Projects can be immediate for the current season’s car, where enhanced designs mean we need to supply new seals within a few weeks. Other projects look at new car designs maybe two to three years ahead. We run trials, we analyze data, we look back at previous design iterations and we use all of this information to create the right solution,” says Paul.

Every year, the FIA brings out new regulations for the cars and teams to follow. “One of the big changes recently is the increase in the size of the wheels. The cars for the 2022 race season have a totally new design with a new wheel size of 18-inches in diameter, a substantial change from the previous standard of 13-inch wheels in place for more than a decade,” continues Paul. “This change in wheel diameter meant a change in the wheel rim and wheel hub seal designs. It also meant a change in our manufacturing process to ensure we could create a seal with such a large diameter.

“The seals for the wheel rims and drums are used to control the airflow through the wheel to make the car more aerodynamic, and at the same time control the temperature. As the seals are close to the brake discs that can operate at temperatures in excess of +1,000 °C / +1,832 °F they must also be able to withstand extreme heat for long durations of time,” says Paul.

Optimum Performance

“Until recent years, testing of the cars and technology was over a three week period at the start of the race season, and then every other weekend for two to three days at a time.

“We work as an extension of the race team, delivering a high-quality service with minimal room for error.”

AMUL PATEL

General Manager, Race-Tec, UK



This has now been reduced by the FIA, with test days restricted to just two shorter three day periods at the start of the season. “We refine, refine, refine. We use Finite Element Analysis (FEA) testing to ensure our products will perform as expected, as the teams have far less room for error now. Testing is done during the races with continual developments for improved performance and reduced friction. We have to be adaptable to meet the unique requirements of our customers and continually evolve our materials, products, and solutions,” says Amul.

Paul continues, “we are continually developing our solutions based on feedback from our customers. If one of the F1 teams is experiencing uncharacteristic wear on a part, for example, we will work closely with the team’s engineers to complete a full failure analysis to identify the root cause of the problem. Then we engineer out the issue and extend the life of the seal.”

Sustainability

Motorsports are changing. In 2014, Formula E made its debut in Beijing, China, an all-electric international street racing series with the goal to showcase what sustainable mobility could look like and what it could be capable of achieving to bring electrification of vehicles into the mainstream.

Formula E, alongside the adoption of dual heat and kinetic energy-recovery systems in F1 has meant electrification has become more prominent in motorsports, rapidly spreading to World Rallycross, Motorcycle TT and World Rally Championships. In 2024, the Le Mans 24-hour race in France will introduce a racing class for electric vehicles powered by hydrogen fuel cells.

"We collaborate closely with our customers to provide custom solutions that not only help to increase performance and efficiency but also support sustainability initiatives. Even a small efficiency gain is significant," says Amul. "It allows for reduced power consumption and less energy usage which in turn support F1's 'factory to flag' sustainability strategy and commitment to reaching net-zero by 2030."

"The engine in an F1 car is already the most energy-efficient of any form of technology; it produces more power per liter of fuel used than any other vehicle engine, and less CO₂ emissions," says Paul. "Already planned for 2026 is the introduction of the next-generation hybrid engines to support the transition to 100% sustainable fuel, something that has the potential to become a mainstream technology in the future in the cars that we all drive."

"The engine in an F1 car is already the most energy-efficient of any form of technology; it produces more power per liter of fuel used than any other vehicle engine."

PAUL BRAIN

Engineering Manager, Race-Tec, UK



The Future is Bright

Motorsport is pushing the technology boundaries, not only in automotive, where we see F1 technology already being used in hypercars and supercars, but in a range of industries. "Motorsports push the performance envelope of products that can then be used in other applications where high-temperature resistance or extreme wear resistance is key. The development of hybrid engine technology is already available in mainstream road cars for you or me to drive, supporting the move to sustainable transportation. Our sealing technology has helped to make this possible," says Amul. ▾



Finite Element Analysis (FEA) testing allows us to refine our solutions and ensure our products will perform as expected.

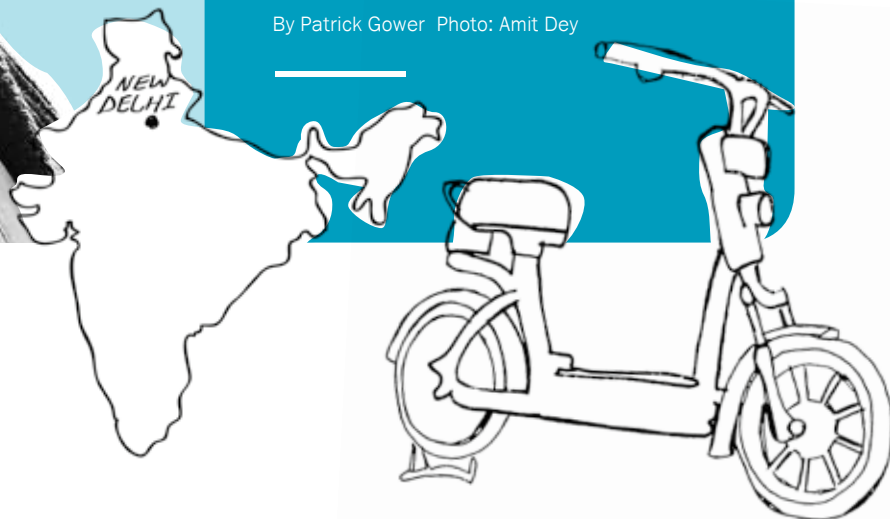


MOUSHUMI MOHANTY,
Head of the Electric Mobility Programme at
the Centre for Science and Environment (CSE) in India

Electrifying India

The electric vehicle revolution has arrived in India, but not how you might think. Moushumi Mohanty and her staff have led a CSE think-tank with several Indian states. The aim was to form more detailed plans to successfully navigate the continued EV transition.

By Patrick Gower Photo: Amit Dey



“Electrification is here, but it’s on two and three wheels, not four,” says Moushumi Mohanty, head of the Electric Mobility Programme at the Centre for Science and Environment (CSE), a New Delhi-based think-tank.

“The Indian government is providing large subsidies to the two- and three-wheeler segments and together they will lead the country’s electric mobility goals in the short-to-medium-term.”

Motorcycles and three-wheelers — mostly rickshaws — are relatively cheap, popular and have low power requirements, making them ideal candidates for electrification on a large scale. More than half of the Indian government’s subsidy package designed to speed up the manufacturing and adoption of electric vehicles aims at two- and three-wheelers.

The Indian Government does not lack ambition. It wants 30 per cent of new vehicle sales to be electric by 2030, a target that would require the electric vehicle (EV) sector to expand at an annual rate of 46 per cent, right up to the target date. At first glance that looks plausible, at least

for two and three-wheelers. Between 2011 and 2019, the electric two-wheeler market grew at an annual rate of 19 per cent, while the electric three-wheeler market expanded at a rate of 73 per cent, according to the CSE think-tank. However, these gains were from an almost standing start, and they become harder to reproduce as the market becomes larger.

Despite all that rapid growth, the market for EVs remains tiny in relation to that of combustion engines. Two-wheelers

“The Indian government is providing large subsidies to the two- and three-wheeler segments and together they will lead the country’s electric mobility goals in the short-to-medium-term.”

MOUSHUMI MOHANTY





made up more than 84 per cent of EV registrations in 2021, yet they have just a 0.15 per cent market share of the total market for two-, three- and four-wheelers. That makes reaching the government's 2030 target a tall order. "The numbers aren't quite so impressive yet, but we do expect them to take off over the next two to three years," says Mohanty.

Rising take-up is partly about product availability — one of the many "chicken and egg" situations that have challenged the expansion of the electric vehicle sector globally. Producers often want guarantees that a deep pool of demand exists before they will ramp up production, while consumers need to have genuine choice to be able to purchase in large enough numbers. Mohanty says that the same has historically been the case for charging infrastructure, with stakeholders reluctant to invest for small numbers of EV owners.

"It requires the producer and the consumer to spend on the new technology for it to gain traction, then the momentum kicks in," she adds. "There have been some big commitments made to developing charging infrastructure and clearly the numbers have to be much larger, but India is working on it."

Momentum is indeed building. Last year, electric scooter manufacturer Ola pledged to spend 2 billion USD on a factory in the southeastern Indian state of Tamil Nadu. The "Future Factory" will have the capacity to produce ten million electric scooters a year. Meanwhile, Bajaj Auto, a leading manufacturer of both two- and three-wheeled models, has pledged to invest almost 134 million USD, ramping up production via an expansion of its Pune factory. In August 2021, TVS, India's third-largest two-wheeler manufacturer, announced that it would spend the same amount launching a new product line of electric bikes.

States are utilizing their powers to fuel the transition, too. In January, the Delhi government announced rules to ensure that 50 per cent of new two-wheelers and 50 per cent of new cars working for app-based delivery and cab services are electric by March 2023.

However, many of these expansions hinge on the ability of manufacturers to gain better access to batteries. For manufacturers, access to raw materials can be difficult and 30 to 40 per cent of these materials are not sourced locally,

BIOGRAPHY

Moushumi Mohanty

Lives: Gurugram, National Capital Region of Delhi, India

Occupation: Head of the Electric Mobility Programme at the Centre for Science and Environment, New Delhi, India

What keeps you motivated: My husband has asthma, and we've noticed that whenever we are on holiday in Kerala where the air is cleaner, he doesn't use his inhaler as much as he does here. That's something I see day in and day out happening in front of me. That's my personal context to the India EV story.

Hobbies: I love gardening, reading and cooking.

according to the CSE. Plus, the high cost and intensive R&D needed for cell development makes the ability to scale up cell production imperative if it is to become viable.

That is the downside to focusing on two- and three-wheelers, which require only small batteries — around 4 kWh for two-wheelers or 7 kWh for three-wheelers. Four-wheeled EV batteries can range anywhere from 20 kWh to 100 kWh, so manufacturing an equivalent number of four-wheeled vehicles to two- and three-wheelers could unlock the large scale required to make mass production feasible. "Demand for four-wheelers means a requirement for larger batteries,

"There have been some big commitments made to developing charging infrastructure and clearly the numbers have to be much larger, but India is working on it."

MOUSHUMI MOHANTY

which in turn creates a case for battery manufacturing," says Mohanty. "Let's be honest, this is a volume game, and we need much larger volumes for battery manufacturers to be able to achieve scale at some point." →

“India has started on this journey, and it is not going to be a linear path. It will be back and forth, back, and forth. I mean, that’s how it is, right? You learn and you tweak, and you change, and you move.”

MOUSHUMI MOHANTY



And yet there may be innovative methods to navigate these hurdles. People buy between three and four million cars each year in India and Mohanty says that switching the starter battery from lead acid to lithium (integral to EV batteries) would generate that scale quickly. “If you do that, you will immediately create the pool of demand for these batteries,” she says. “Once that happens, a lot of other parameters will fall into place.”

It is one of numerous suggestions Mohanty has brought to policymakers tasked with meeting both the ambitious EV adoption and supply side targets under production-linked incentives. Despite the scale of the task and the various gaps in policy, Mohanty is optimistic that the EV revolution remains on track. She led a workshop at the CSE think-tank in March 2022, with various Indian states in attendance, where the aim was to form more detailed plans to successfully navigate the transition.

The Indian states recognize “there is this job to be done,” says Mohanty. “India has started on this journey, and it is not going to be a linear path. It will be back and forth, back, and forth. I mean, that’s how it is, right? You learn and you tweak, and you change, and you move.”



India’s EV revolution in numbers

30%

The government is targeting 30 per cent of total vehicle sales to be electric by 2030

46%

The annual growth rate in EV sales required to meet the government’s EV adoption target

0.15%

The current market share of electric two-wheelers

134,844

Electric vehicle registrations in India during 2021

113 km

The distance YC Electric’s Yatri Super rickshaw can travel on a single charge; among the furthest on the market

**1.5 billion
USD**

The value of the second phase of the Indian government’s Faster Adoption and Manufacturing of Hybrid and Electric vehicle (FAME) subsidy scheme, aimed at speeding up the adoption of electric vehicles

Sources: The CSE, Ministry of Road Transport & Highways, Government of India, Ministry of Heavy Industries, Government of India.

Powering the Future Sustainably

Green hydrogen is considered the fuel of the future for heavy-duty trucks, long-range buses, commercial vehicles, ships, and even aircraft.

By Sophie Hudson and Meghan Cloud Braunger

A ZERO-CARBON FUEL, GREEN HYDROGEN, is hydrogen generated using renewable energy, such as wind, solar and hydropower. Renewable energy sources power the electrolysis of water, which splits hydrogen from oxygen. The green hydrogen is then used as a fuel source, and the oxygen is released into the atmosphere with no negative impact on the environment.

Hydrogen for a Climate Neutral Future

“Hydrogen is key to achieving the European Green Deal, an initiative to make the European Union a net-zero emitter of greenhouse gases by 2050,” explains Axel Weimann, Global Segment Director Automotive, Trucks & Transportation. “Renewable energy sources like wind and solar fluctuate and are not available everywhere in equal amounts. Where a surplus is generated, this can be used to feed the power to hydrogen process. Hydrogen can be stored and transported to places where energy consumption is high and energy from renewable sources is not sufficient.”

Hydrogen is considered the fuel of the future in cases where battery electric vehicles are less attractive. “Long haul heavy trucks are a great example,” describes Axel. “Hydrogen enables quicker refueling, a higher payload and extends the distance between refueling stops.” →

Unique Challenges


Hydrogen has very special properties and requires innovative, tailor-made sealing solutions. The hydrogen molecule is the smallest element, so permeation is a challenge. When hydrogen is compressed or liquefied and stored, seals must operate at extremely high pressures and very low temperatures.

“The hydrogen refueling process presents very unique challenges for seals,” Axel explains. “At filling stations, hydrogen can be stored as a liquid or a gas. Both forms have demanding requirements. Liquid hydrogen, or LH2, requires extremely low temperatures for storage. Gaseous hydrogen must be compressed to achieve acceptable energy density. And, the expansion behavior of hydrogen is very special. As hydrogen flows into the vehicle, it heats up. It must be cooled down before flowing in to protect the valves, tank and fuel lines.”

Innovative Sealing Solutions

“A lot of know-how goes into developing the optimum sealing solutions for hydrogen applications. Solving these challenges is a combination of the right material and the right design, as well as other considerations, like counter surfaces,” explains Axel. “We are in close collaboration with our customers to develop the sealing technology for their hydrogen applications, since we know hydrogen is a crucial component of the future energy mix.”

To #ProtectTheEssential, Trelleborg Sealing Solutions is developing and testing new materials and solutions to meet the unique requirements of hydrogen. This includes O-Rings, Back-up Rings, lip seal gaskets, Slydring® wear rings and molded parts made from Ethylene Propylene Diene Monomer (EPDM), Fluoroelastomers (FKM) Polyurethane (PU), Polytetrafluoroethylene (PTFE) compounds, and high-performance Thermoplastics, such as Polyetheretherketone (PEEK).

Learn more about our sealing solutions for hydrogen in the next edition of *in the groove!* 

OUR SOLUTIONS FOR THE FUTURE

Trelleborg Sealing Solutions has focused on new materials suitable for use with hydrogen and has already developed special EPDM, FKM and PU compounds, which have been extensively tested in customer applications and in laboratories.

Challenging material requirements:

- Low temperature
- Explosive decompression
- High pressure
- Low permeation

Products:

- O-Rings
- Back-up Rings
- Lip seal gaskets
- Special molded parts
- Slydring® wear rings

Tank Valve

Filling Receptacle

Pressure Regulator

Gas Injector

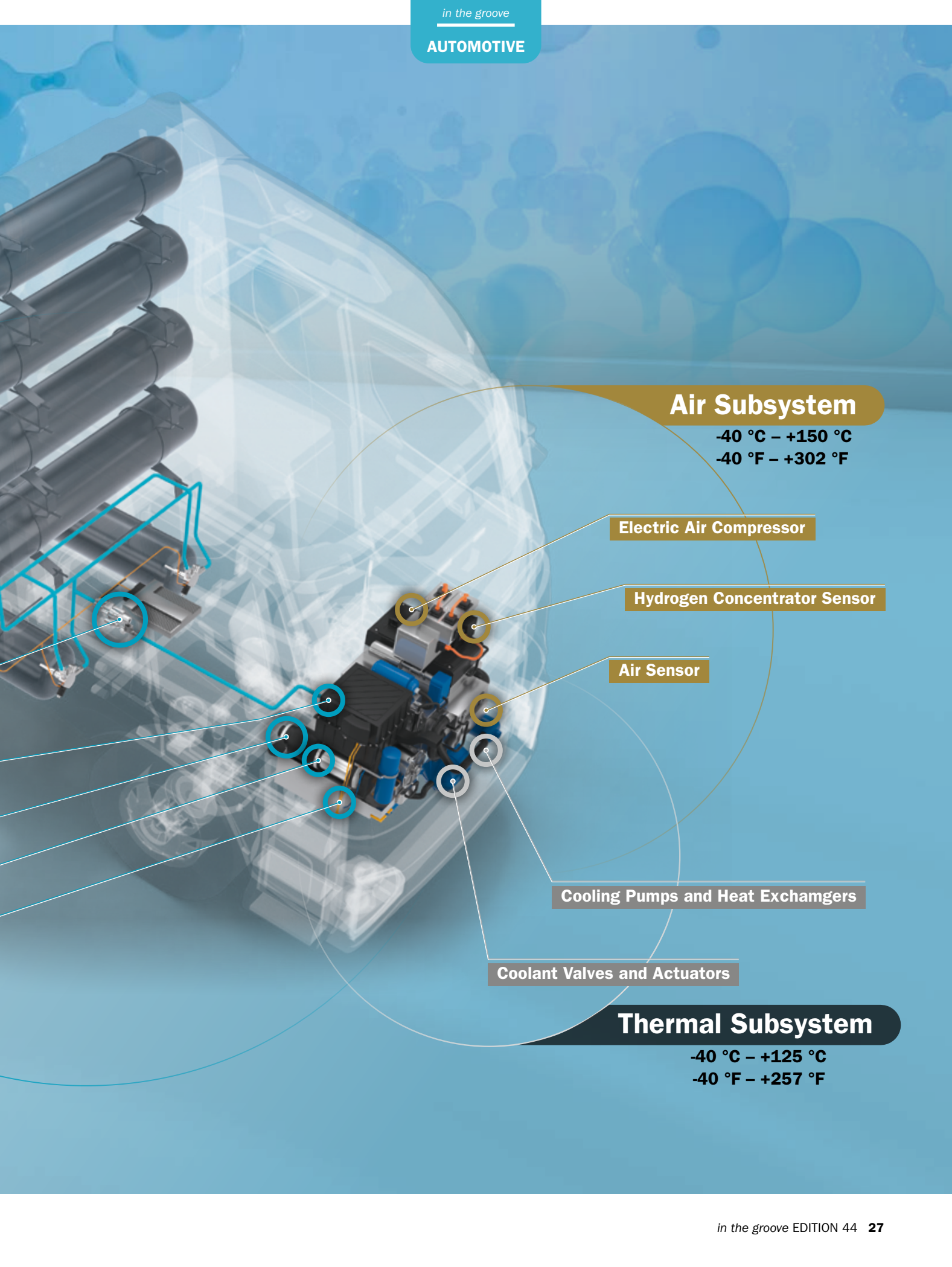
Recirculation Blower

Fuel Cell Stack

Gas Sensor

Hydrogen Subsystem

-50 °C – +150 °C | 0 – 875 bar
-58 °F – +302 °F | 0 – 12,690 psi



Air Subsystem

-40 °C – +150 °C
-40 °F – +302 °F

Electric Air Compressor

Hydrogen Concentrator Sensor

Air Sensor

Cooling Pumps and Heat Exchangers

Coolant Valves and Actuators

Thermal Subsystem

-40 °C – +125 °C
-40 °F – +257 °F

A man with glasses and a dark polo shirt with the Trelleborg logo is smiling and holding a clear plastic box containing a white seal. The background is a dark gradient.

At Your Service

Trelleborg Sealing Solutions is known for its innovative products. More than a component supplier, our product range is enhanced by an extensive service offering: ServicePLUS. We chat with Will Bacon, Trelleborg's ServicePLUS Segment Manager, to find out more.

By Lauren Brune

WILL BACON,
ServicePLUS Segment Manager,
Trelleborg Sealing Solutions

ITG: With vendor consolidation being a trend amongst Original Equipment Manufacturers (OEMs) today, in what ways is Trelleborg ready to help?

WB: While the pandemic has caused some to diversify their supply chain and take into account those risks, many OEMs are still driving to consolidate their supply chain. When OEMs decide to go through consolidation, Trelleborg can aid in the following ways:

- We provide assembly services for ready-to-use components that do not require additional processing. This reduces labor and processing costs by removing non-core value stream activities.
- We offer application engineering support for sealing and industrial engineering expertise for services in the value chain, providing proven solutions that reduce performance warranty claims and labor costs.
- Our ServicePLUS initiatives include various options for Vendor Managed Inventory (VMI), including SealScan™ and patented IntelliStok® systems, to reduce order input and automatically replenish stock.
- Integrator services, such as private labeling, custom packaging, and kitting, remove non-value added activities from the value stream and aid in aftermarket protection.

ITG: In which industries is the trend of vendor reduction seen?

WB: OEMs in all industries face the additional costs associated with having multiple vendors in their portfolio. Large global equipment manufacturers, and large sub-tier suppliers to those manufacturers, are the primary drivers of the vendor reduction initiative. Vendors able to take over portions of these manufacturers' value chains provide additional "soft cost" savings.



Global manufacturers see an additional bonus from global suppliers, like Trelleborg, as they:

- Provide engineering support, reducing the development time for global solutions.
- Ensure consistent quality, ultimately reducing warranty claims.
- Offer global pricing, eliminating price variations from regional suppliers.
- Increase the efficiency of supply chain logistics by manufacturing and/or stocking components close to the OEM's factory.

ITG: What are the opportunities for OEMs when it comes to vendor reduction?

WB: Consolidation is a great growth strategy for OEMs. It helps them achieve greater operational efficiency and creates a competitive edge by meeting objectives related to reducing capital and operating costs and increasing performance and productivity.

Distinct benefits include:

- **Greater buying power through improved pricing, quality, service, and support.** Global OEMs that utilize global vendors see an increased ability to keep up with demand, while receiving the additional focus and dedication they deserve. A global vendor partner can often provide material, product, and application expertise, effectively adding engineering resources to the OEM's team at no additional cost to the OEM. →



“Overall, vendor reduction helps OEMs gain market share and fill gaps in their product portfolios by becoming increasingly efficient and competitive.”

WILL BACON,

ServicePLUS Segment Manager, Trelleborg Sealing Solutions

- **Global vendor partners typically have redundancy built in, thanks to their multiple locations for both manufacturing and service.** This allows for flexibility to always ensure service to the OEM, even if a plant experiences down time or delays. For example, in the past two years, China experienced tariffs and then stopped shipping many products due to COVID. In these cases, Trelleborg worked to find alternate suppliers from other countries to produce parts to keep the supply chain flowing, providing peace of mind for OEMs.
- **Global integrators can protect the OEM's aftermarket by performing private labeling, custom packaging, and kitting services for MRO (maintenance, repair, operating supply) parts.** By having one source, non-compete agreements can be put in place and e-commerce sites developed to service the OEM's full aftermarket line. It also ensures aftermarket parts meet the same quality specifications as the production SKUs (Stock Keeping Units).

ITG: What challenges do OEMs face when consolidating vendors, and how can a supplier help to alleviate these challenges?

WB: OEMs face multiple challenges when consolidating vendors, including risk, quality, and inventory. When a vendor can mitigate these challenges, the consolidation process becomes much easier.

Risk mitigation becomes an issue when parts are sole sourced. Adding a second source helps OEMs reduce risk. When working with large global vendors, second sourcing is often built in, and products and materials are produced in multiple locations. This gives the OEM peace of mind, knowing the product comes from the same manufacturer, made with the same materials and to the same specifications regardless of where produced.

Using multiple vendors for similar SKUs requires OEMs to check for variances. A full-service provider can offer these quality steps for the OEM, thus reducing quality costs and ensuring non-conforming product does not go into production.

Supplier partners that can assume responsibility for managing parts from multiple vendors add value to OEMs, as it is often a challenge to find suppliers that provide a variety of grades of parts. Trelleborg can procure parts from multiple internal and third-party sources, perform quality inspections, and assemble or kit those parts to meet the OEM's needs.

Inventory often becomes complex when managing various SKUs from multiple suppliers. By integrating Trelleborg's SealScan™ or patented IntelliStok® systems, OEMs can virtually eliminate the need to analyze, plan, and manually place purchase orders. This significantly reduces costs within the planning, procurement, and warehousing departments. Inventory systems using SealScan™ or IntelliStok® can often be located directly next to the assembly area, which aids in reduction of warehousing space as well.

ABOUT WILL BACON

Title: ServicePLUS Segment Manager

Education: Master of Business Administration, Thunderbird School of Global Management, Arizona, US

Family: Married with six children

Lives: Vancouver, Washington, US

Interests: Cycling and running
Completed the Seattle to Portland one day ride twice

Favorite Innovation: IntelliStok®, followed by the development of SealScan™

ITG: Can you provide an example of when Trelleborg helped an OEM with vendor consolidation?

WB: An OEM was procuring Trelleborg seals in the US, sending them to Taiwan for subassembly, and then returning them to the US for assembly into the final product.

Trelleborg brought the entire assembly in-house, streamlining the OEM's process by supplying the complete unit. This helped the OEM by reducing vendors, overall inventory levels, and global logistics risk, as well as time and labor in the assembly process.


The solution also saved the OEM significant time and money by eliminating the shipment of product back and forth overseas, and thus, the need to navigate port processing and container issues. Ultimately, this led to reduced freight costs and greater control over the overall process.

ITG: How can a parts manufacturer and service integrator, like Trelleborg, help OEMs with the vendor reduction process?

WB: When OEMs go through vendor reduction, they need the help of a manufacturer and service provider like Trelleborg to deliver ready-to-use components that don't require additional processes. This full-service solution comes with engineering assistance, stocking programs, and minimizes non-core value stream activities, reducing labor costs.

Additionally, Trelleborg's global presence can keep up with regional and global demands, while giving OEMs the focus and dedication they deserve. This is achieved by providing materials, product expertise and services that best suit the OEM's applications, while removing obstacles in the supply chain.

Lastly, OEMs know they will receive the same quality products and services every time.

Overall, vendor reduction helps OEMs gain market share and fill gaps in their product portfolios by becoming increasingly efficient and competitive. 

Want to find out more about ServicePLUS?

Scan the QR code or visit trelleborg.com/seals/literature to read the brochure.



ServicePLUS THE PLUS FOR YOUR BUSINESS

When you partner with Trelleborg Sealing Solutions through our ServicePLUS program, you can focus on your core business while we focus on making sure all your value chain needs are covered. We concentrate on those business activities that typically offer the largest opportunities for saving resources.



TECHNICAL COLLABORATION: Whether starting a new development or enhancing existing products, make use of our experts in materials and design for sealing solutions with optimal application performance. Take advantage of digital tools, sealing technology training and customized seminars to support your technical and commercial teams.



TAILORED PRODUCTION SERVICES: State-of-the-art 3D printing and rapid prototyping help bring your products to market faster. Strengthen your core business processes by outsourcing subcomponent assembly and secondary operations to us.



PACKAGING SOLUTIONS: Our packaging and labeling solutions boost your aftermarket care. Designed to meet your specific needs, including custom tubing for direct insertion into automated feeding stations, bespoke machine-readable labeling for replacement part sets and aftermarket kits directly drop-shipped to your service centers or customers.



SURFACE TECHNOLOGIES: Improve friction characteristics and eliminate sticking with surface modifications, such as Seal-Glide®, to reduce costs in automated assembly and improve application performance. Ensure parts are as clean as they should be for sensitive applications and strict regulations with FlexClean™.



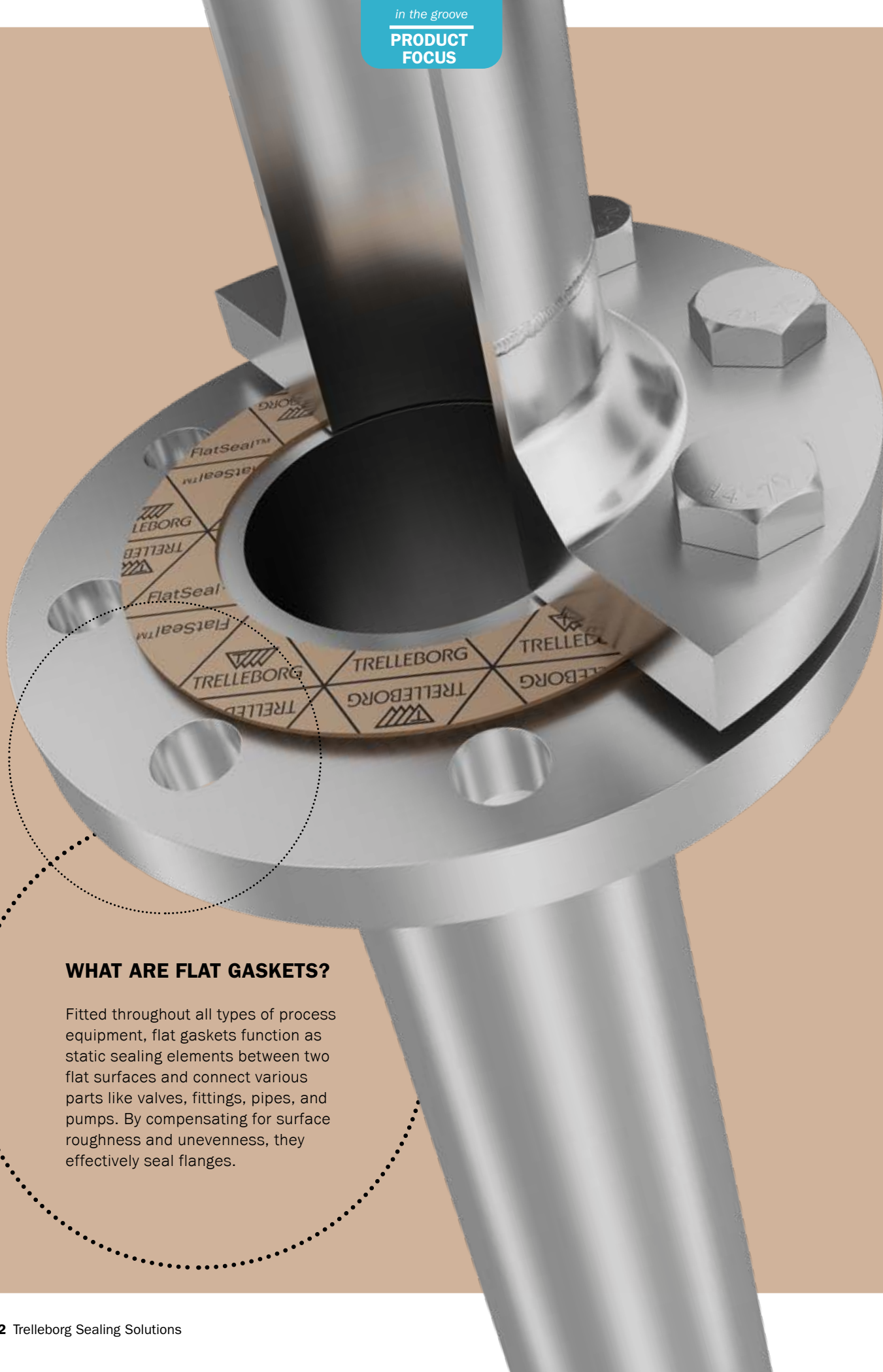
TESTING & QUALITY ASSURANCE: We are all set to run a full suite of material and product tests to improve efficiency and help reduce your inspection expenses. Fully automated inspection cells and quality clinics can verify performance and compliance with standards, along with full documentation.



ADVANCED DELIVERY & STOCK MANAGEMENT SERVICES: Simplify, streamline and enhance your supply chain by letting us manage your important C-Class parts or benefit from automated ordering services that optimize your replenishment processes and align with production flows.



SUBCOMPONENT ASSEMBLY: Our assembly services provide you with a single item to manage, rather than multiple individual components. Our experts ensure that seals have been installed properly, meeting quality requirements. Additional testing, such as leakage and magnetic testing, product marking and customized packaging can be integrated to ensure your quality requirements are met.



WHAT ARE FLAT GASKETS?

Fitted throughout all types of process equipment, flat gaskets function as static sealing elements between two flat surfaces and connect various parts like valves, fittings, pipes, and pumps. By compensating for surface roughness and unevenness, they effectively seal flanges.

Flat Solutions

Flat gaskets are everywhere, and their materials need to meet challenging industry specific requirements. Partnering with customers, Trelleborg Sealing Solutions now offers the HMF FlatSeal™ range of specially developed materials that stands up to the most demanding of applications.

By Meghan Cloud Braunger

THE NEW RANGE OF HMF FLATSEAL™ flat gasket materials from Trelleborg Sealing Solutions includes specialist materials for use with harsh chemicals and media in aerospace, automotive, oil & gas, food & beverage, medical, chemical processing, and pharmaceutical industries, providing an option for almost any application.

Developed in Partnership

Marco Schildknecht, Chemical & Processing Segment Manager for Europe at Trelleborg Sealing Solutions, says: “To ensure gasket materials meet operating requirements, we collaborate closely with customers to specify materials and fine-tune gasket geometry to optimize overall sealing performance.

“We’ve designed our new line of HMF FlatSeal™ gasket materials for virtually all applications. The range includes 20 materials, from standard options for low to moderate pressure and temperature applications, to high performance solutions for challenging high temperature environments, and ones that meet stringent industry regulations and standards.”

Ensuring Equipment Meets Environmental Requirements

One of the most critical roles of flat gaskets is to minimize leakage so equipment performs according to industry environmental requirements. Gasket materials must therefore match their operating situations.

For instance, components used in cleanrooms must stay leak-free to prevent contamination. Chemical and petrochemical plants must comply with fugitive emissions regulations, which seek to prevent the release of harmful substances into the atmosphere. Similarly, cooling applications containing refrigerants are subject to Regulation (EC) 842/2006, a European regulation on fluorinated greenhouse gases.

Marco highlights one example, explaining, “In order to comply with environmental regulations, cooling compressors must be tightly sealed. This regulation prohibits the refilling of certain refrigerants and leakage is not only harmful for the environment, but also decreases the lifetime of equipment.

“In an application like this, FlatSeal™ HMF17 is ideal. It is a unique material, which combines the flexibility and tight fit of an elastomer with the robust strength and mechanical stability of a fiber material. It is compatible with the refrigerants used in the compressor and effectively prevents leakage, which keeps the compressor running longer.”

Less Suppliers

The range also supports customers in vendor reduction. “We see a continuing trend for our customers to streamline their supply chain,” says Marco. “By providing a one-stop-shop for flat gaskets, the FlatSeal™ range will help original equipment manufacturers to do this.” →

FLATSEAL™ SELECTOR



Need help specifying a FlatSeal™ for your application?

The new FlatSeal™ Selector helps you select a material based on operating conditions and calculates the surface pressure in your application.

Scan the QR code now:





HMF FlatSeal™ Material Portfolio

The Trelleborg Sealing Solutions range of flat gasket materials consists of 20 products in six product families that will satisfy the requirements of almost any application.

FlatSeal™ HMF10 Series

Elastomer-bonded fiber gasket materials

Composed of a blend of aramid fibers, elastomer materials and special functional fillers, this family includes five materials, which are suitable for a wide range of conventional applications.

- **HMF10** Versatile in a wide range of applications
- **HMF15** Engineered for use with oils, fuels, hydrocarbons, and steam
- **HMF16** Cost-effective solution for standard applications
- **HMF17** Combining tight fit and robust strength
- **HMF18** High performance for chemical and industrial applications

FlatSeal™ HMF20

Fiber-reinforced graphite gasket material

Combining the properties of conventional fiber and graphite gasket materials, FlatSeal™ HMF20 demonstrates effective long-term performance in high pressure applications.

FlatSeal™ HMF30 Series

Expanded graphite gasket materials

Graphite-based flat gasket materials designed to effectively seal under extreme temperatures and pressures and in applications containing harsh chemicals, this family of materials consists of a high-performance expanded graphite foil. When combined with a metal layer or layers and an inorganic treatment to enhance oxidation resistance, the materials have their own unique performance profile.

- **HMF30** Versatile with expanded metal layer
- **HMF31** Enhanced sealing performance to meet fugitive emission requirements

- **HMF32** Enhanced oxidation resistance with outstanding anti-stick properties
- **HMF33** Combines superior sealing performance with enhanced oxidation resistance
- **HMF35** Graphite sheet without metal insert
- **HMF36** Multilayer structure for superior performance
- **HMF38** For complex gasket geometries

FlatSeal™ HMF40 Series

Polytetrafluoroethylene (PTFE) based gasket materials

Demonstrating virtually universal chemical compatibility, this family of gasket materials offers outstanding sealing performance to ensure safety and to optimize the efficiency of food and chemical processing equipment.

- **HMF41** Enhanced flexibility for stress sensitive flanges
- **HMF42** High mechanical strength for aggressive alkalis
- **HMF43** Robust gasket for high temperature applications
- **HMF45** Expanded PTFE offers unique properties
- **HMF48** Suitable for universal use in food contact applications


FlatSeal™ HMF66

Phlogopite mica gasket material

Specially engineered for use in the most demanding operating environments, the material consists of a phlogopite mica composite with an expanded metal inlay, combining superior sealing performance with enhanced strength.

FlatSeal™ HMFEG

Medical grade Ethylene Propylene Diene Rubber (EPDM) gasket material

Specially engineered for use in medical, pharmaceutical and biotechnology applications, the material is compliant with a wide range of industry-relevant standards and approvals. 

FLATSEAL™ CODE TECHNOLOGY

Unique identification for full traceability

FlatSeal™ HMF17 and HMF18 are equipped with FlatSeal™ Code Technology. Every production batch is given a unique ID, which enables full traceability of the calendared sheet after punching and cutting operations. The specially developed technology serves as a permanent fingerprint and allows identification of gaskets, regardless of the temperatures and exposure time of media, as well as the length of time in operation.

FlatSeal™ Code Technology makes FlatSeal™ HMF17 and HMF18 suitable for “Industry 4.0” applications that need full traceability.



Send in the Drones

Drones delivering fast food, pharmaceuticals and supermarket items have become a regular part of life in the Australian city of Logan. Now, after a shaky start globally, drone technology could be on the verge of widespread acceptance and commercial success.

By Daniel Dasey Photos: Wing

IN HIS GROCERY STORE IN THE EASTERN AUSTRALIAN CITY OF LOGAN,

Maz Rizk has just received a home-delivery order for one of his tasty roast chickens. In other parts of the world, Maz might hand the requested dish over to an Uber Eats, DoorDash or Just Eat courier so they could take it by car or motorcycle to the customer. But things in Logan operate a little differently.

Maz's grocery store has partnered with drone delivery company Wing and fulfils multiple hot chicken orders from their site every day. The chicken, packaged in a customized cardboard box, is picked-up by a drone hovering overhead from a launch zone. A staff member secures the box to a clasp at the end of a line dropped by the drone and watches as it rises up and becomes secured against the underside of the drone. The unmanned aircraft then efficiently buzzes up and away.

"Customers love the drone delivery service," says Maz, whose business, Friendly Grocer Crestmead, also frequently sends milk, eggs, bread and confectionary via Wing. "The drone can carry a load of up to 1.5 kilograms. It doesn't replace a full grocery shop, but it means our customers can save a trip to the store when they're short on time or if they've forgotten a few items."

Consumers anticipating the widespread roll-out of delivery drones have been on a rollercoaster ride since the concept first came to mainstream attention in 2013. It was then that digital retailer Amazon floated plans for the use of delivery drones to fulfil customer orders, via a service ultimately known as Prime Air. With such a large company advocating the idea, many imagined we were on the immediate cusp of an era when drones would become commonplace in our cities, carrying every type of consumer item. →



Above: A Wing team member prepares a drone for its next delivery. A Wing drone can carry a load of up to 1.5 kilograms.

But the reality is somewhat different. Nine years on, Amazon is yet to bring Prime Air to successful commercial fruition, despite countless hours of testing, promoting, and lobbying for regulatory approvals. Other drone delivery services have burst onto the scene with great fanfare, only to fade away not long afterward.

However, the positive experience of Wing in Logan has many drone delivery enthusiasts excited. Dr Catherine Ball, a futurologist and Associate Professor at the Australian National University (ANU) points to the 'Gartner hype cycle' model to explain the faltering progress with drones to date. Developed by American research firm Gartner, the model aims to chart the path taken by innovative new technologies as they progress from development to wide adoption. Initially, expectations tend to soar as people consider the potential benefits of a new technology. Then comes a 'trough of disillusionment' as it takes longer than expected for the desired results. This is followed by a 'slope of enlightenment' as businesses learn from their mistakes, and finally comes the 'plateau of productivity', as businesses successfully commercialize the technology and make money from it.

"I would say that drones are on the slope of enlightenment right now," says Dr Ball, who is also co-founder of the World

WING'S DRONES

Wing uses electric, autonomous, lift-and-cruise style multi-copter drones with a top speed of almost 100 km/h. These use 12 vertical lift propellers and two forward propellers.

Each unit weighs 4.8 kilograms and can carry payloads up to 1.5 kilograms. The drones can travel about 20 kilometers before recharging, and multiple batteries and navigation systems are in place for the sake of redundancy.



of Drones and Robotics Congress. "There was a buzz around drones in 2015/16. Then, in 2017/18, they kind of started getting less sexy. More recently, during the pandemic, they have come into their own in a number of places."

Wing, owned by Google's parent company Alphabet, has been trialing its drone delivery services in Finland, the United States and Australia since 2019. In addition to the operation in Logan, Wing provides drone delivery in parts of Canberra, the southern Australian city that is the location for the country's Federal Parliament and the country's capital.

Ordering via the service is in many ways similar to ordering via a regular terrestrial delivery service. Users scroll through an app to choose from various offerings of coffee, fast food, groceries, confectionery, and pharmacy items, such as toothpaste. However, there are differences, too. To accept a delivery, the user must have a suitable open space nearby, free from powerlines and overhead trees. Also, deliveries are to a limited geographic area during the trial phase.

To date, Wing in Logan has successfully delivered tens of thousands of coffees, as well as thousands of loaves of bread and roast chickens. The company made over 140,000



Above: Drones will become more important, not only for everyday life but also for emergency care.

WELCOME TO THE WORLD OF DRONES AND ROBOTICS.

Visit the WoDaR website to explore the world of drones, robotics and associated technologies and their application to industry, commerce and government services.

www.worldofdronesandrobotics.com

SCIENCE FACT – NOT FICTION

Trelleborg uses its knowledge and expertise in aerospace sealing to support engineers designing drones, ensuring their effective operation whatever the conditions. Resisting harsh environments, specialized materials stand up to extreme temperatures, both cold at high altitude and hot at the height of the summer in Australia, for instance. To make sure motors and electronics have a long life without breakdown, a key focus is to prevent ingress of dust and water, protecting sensitive electric dynamic components.

Delivery drones are just one part of Trelleborg Sealing Solutions future-looking Urban Air Mobility (UAV) offering.

Check out the break out on UAV applications on page 12.

deliveries to customers across its three countries of operation in 2021 — an increase of more than 600 percent from 2020.

Dr Catherine Ball believes part of the success of Wing in Logan comes down to state authorities creating specific, stand-alone policies to permit and regulate the commercial use of drones. In most parts of the world, this is not the case. It might also help that Logan is relatively suburban, with many parks and open spaces.

“I would say that drones are on the ‘slope of enlightenment’ right now.”

DR CATHERINE BALL, Associate Professor at the Australian National University (ANU)

Dr Ball says there are challenges standing in the way of the further roll-out of commercial drone operations around the globe. However, solutions are emerging. “Singapore and Toronto are both looking at having remote traffic management systems in place, with transponders and markers on drones.

This would make it possible to see where drones are, in four dimensions. And this would allow for designated corridors where drones can fly and be tracked.”

Similarly, noise concerns, a common theme when discussing drones, are now addressed. New generation drones are far quieter than their predecessors and Dr Ball points out other delivery methods also involve some noise. “People get pizzas delivered on two-stroke motorcycles, which are actually quite loud.”

So, what does the future hold? Dr Ball anticipates far greater commercialization of drone operations globally over the coming decade. In addition to drone deliveries, we can expect increased use of drones by emergency services. Drones might ferry supplies to snakebite victims or reach people stranded by floods. Government departments may use them to share documents, and B2B supply services for things like urgent spare parts are also likely to be popular.

“The whole area has matured so much in the last 10 years,” says Dr Ball. “And I think the next 10 years are going to see the realization of a lot of business models that people hoped were going to happen five years ago but haven’t got there quite yet.”

In Your Own Language

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

By Maria Rifaut

Jared Ripoli, Applications Engineer at our Customer Solution Center (CSC) in Schaumburg, Illinois, in the US, 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?

JR: The best part of my job is that there is no “typical day”. Each day brings new challenges to overcome and chances to grow. I may be out visiting a customer and walking their factory floor or analyzing an application to help them select the best seal package to meet their needs. My goal is to encourage collaboration and to bridge the gap between our local customers and Trelleborg’s global expertise.

ITG: How do you and your team support our customers in their daily business?

JR: I primarily focus on supporting customers in the fluid power, food and beverage, and water industries. By having a deep understanding of the critical requirements of these segments, our team members are able to act as industry experts for our customers and provide as much value as possible.

ITG: How do you interact with your colleagues globally to provide solutions for customers around the world?

JR: By maintaining close communication with our local customers, we are able to understand their critical needs. With this knowledge, our team can leverage global expertise within Trelleborg Sealing Solutions, whether technical through

manufacturing and R&D, delivery through logistics, or by working with other CSCs.

ITG: What is your favorite thing about working in the Customer Solution Center in Schaumburg?

JR: That’s being able to work face-to-face with the other members of the CSC to achieve our goals. The people who work there are great and the biggest strength of the operation. The CSC is also home to colleagues from other departments and segments; meeting people with a wide variety of job functions and experience is always interesting.

ITG: How would you describe the US to someone who has never visited the country before?

JR: The US is hard to sum up in a few sentences. There is something for everyone, whether you like big cities, remote natural wonders, or anything in between. As for Chicago, nothing beats a warm, sunny day downtown along the lakefront. If you don’t like the cold though, I would avoid visiting in the winter! ❄️

MORE INFORMATION



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

“By maintaining close communication with our local customers, we are able to understand their critical needs.”

JARED RIPOLI,
*Applications Engineer at the Customer
Solution Center, Schaumburg, Illinois, US*

ABOUT ME

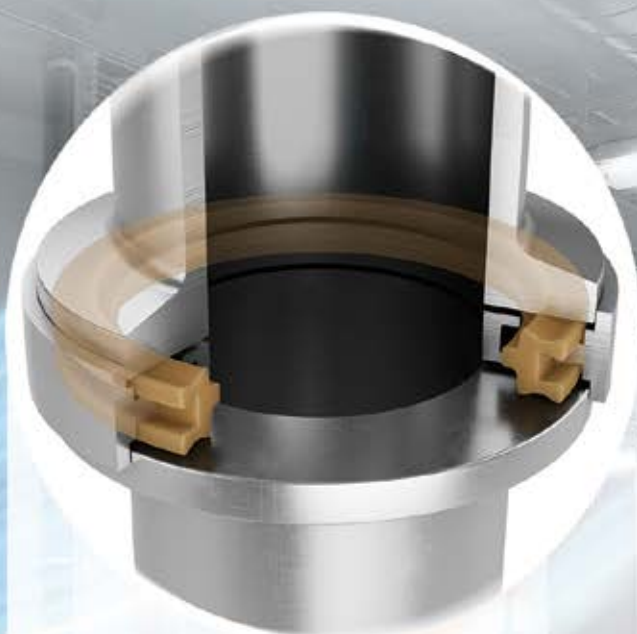
My favorite book: *Slaughterhouse-Five*
by Kurt Vonnegut

Hobbies: My favorite hobbies include long distance running, watching movies, and going camping with my girlfriend and our dog.

Favorite food: Deep dish pizza

Mission-Critical

Launching the Isolast® K-Fab™ Seal



ISOLAST® PUREFAB™ SEMICONDUCTOR MATERIALS

With rising temperatures and increasingly aggressive chemicals in the subfab environment, current industry standards for vacuum flange seal design and materials are not optimal for the extreme conditions now faced. “Over-stressing” of the seal occurs, negatively affecting seal life and resulting in unexpected downtime.

The Isolast® K-Fab™ range from Trelleborg Sealing Solutions is a robust sealing solution specifically developed for fab production and is ideal for sealing system upgrades in critical locations, maximizing operational efficiency and reducing downtime. Combining optimum material selection with an engineered assembly solution, not only achieves high-temperature seal reliability in the subfab, but also a lower cost of ownership.

The extreme temperatures and aggressive chemicals in semiconductor subfab applications require a reliable sealing solution to prevent premature failure and provide long-term sealing. Trelleborg Sealing Solutions Isolast® K-Fab™ Seal does just that.

By Sophie Hudson




WITH ITS SEALING ELEMENT MANUFACTURED FROM MATERIALS specially formulated for semiconductor applications, the Isolast® K-Fab™ Flange Seal ensures the highest level of chemical and temperature resistance.

Reliable Sealing for Extreme Environments

“The Isolast® K-Fab™ Seal is resistant both to the complex chemistries and the extreme temperatures found in critical subfab environments, which we know are extremely destructive to the elastomer seals in flanges. This new flange seal is an alternative sealing solution to a traditional O-Ring to prevent premature failure,” says Chris Busby, Segment Director, Semiconductor and Product Line Director, O-Rings and Engineered Molded Parts at Trelleborg Sealing Solutions.

Temperature resistant up to +325 °C / +617 °F, the Isolast® K-Fab™ seal can be produced from aluminum or stainless steel and combined with a range of specialty elastomer materials, including Isolast® FFKM, Isolast® PureFab™ FFKM for ultra-high purity and PureFab™ FKM. “The flexible use of our elastomer compounds helps to lower the overall cost of ownership for our customers by matching the material performance with a specific subfab application,” continues Chris.

Optimized Design

The seal features a custom seal geometry that utilizes significantly less rubber to eliminate groove overfill and extrusion. This results in improved thermal properties, and the elimination of thermal expansion. Unlike an O-Ring, the seal geometry of the Isolast® K-Fab™ flange seal can withstand misalignment of the flange, ensuring easy assembly. The optimized seal design increases performance, especially with varying pressure or vacuum conditions. “The unique design includes a retained seal feature that ensures the seal is easy to retrofit into NW/KF/ISO vacuum fittings. Assembly of the flange is also made considerably easier by the design of the elastomer element that results in a puzzle-shaped connection to the flange insert,” says Chris. 

ABOUT SEMICONDUCTORS

- Semiconductors are small conductors of electricity, commonly known as chips, used in everything from cars to appliances to medical devices, as well as the more obvious places you would expect to find them – computers, tablets, and smartphones.
- According to Deloitte, in 2022 the size of the global semiconductor chip industry is expected to reach about \$600 billion USD.¹
- The majority of the world’s semiconductor manufacturing is concentrated in just a few countries, including Taiwan, China, and South Korea.
- Chips are complex structures made from thousands or even millions of tiny components and transistors with layers of circuitry connecting them.
- Features in advanced chips can be as small as two nanometers. This allows for a chip the size of a fingernail to incorporate 50 billion transistors.²

¹ <https://www2.deloitte.com/us/en/pages/technology-media-and-telecommunications/articles/semiconductor-industry-outlook.html>

² <https://www.anandtech.com/show/16656/ibm-creates-first-2nm-chip>

MORE INFORMATION

Find out more about the Isolast® K-Fab™ Flange Seal. Visit our website and download the brochure to find out more about this innovative new seal.



Visit the New Virtual Showroom

Immerse yourself in innovative sealing technology

Come visit the virtual showroom, where you can discover sealing technology up close. This new web-based tool gives visitors an intimate look at selected products, materials, services and capabilities.

Visit the showroom at:
www.trelleborg.com/seals-showroom



VISIT THE SHOWROOM TO:

Explore galleries

on selected industries, such as eMobility, Aerospace, Off-Highway and Food & Beverage, as well as Research & Development, Advanced Manufacturing Capabilities and ServicePLUS. Each gallery highlights key issues and how we help.

Interact with exhibits

utilizing 3D animations, so you can experience technology to gain a full understanding of our capabilities. Each exhibit highlights the customer challenge, our solution, a brief description and a list of benefits.

Access more in-depth information

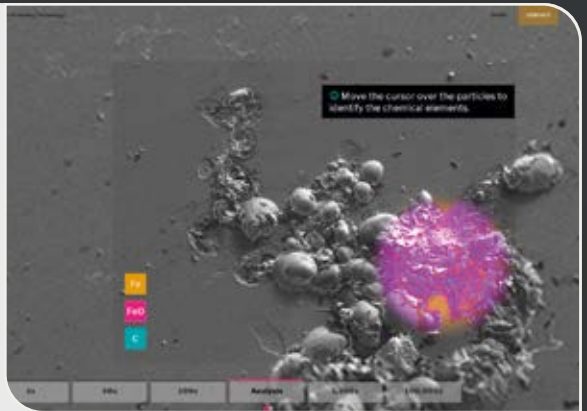
via links to relevant media and literature, which are included in each gallery and exhibit. This gives you the ability to access additional information at the click of the mouse.

VIRTUAL SHOWROOM FUN FACTS

- Browse **29 exhibits** in eight galleries
- **Six industries** highlighted: Aerospace, Automotive & eMobility, Fluid Power, Food & Beverage, Off-Highway, Semiconductor
- **Five test rigs** show how seals are tested to the extreme
- **Four languages:** English, German and Traditional & Simplified Chinese

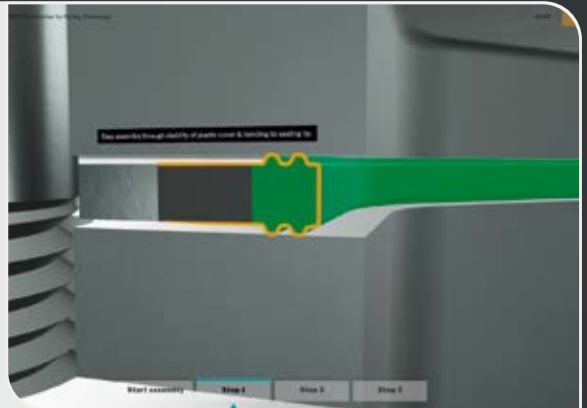
Have you ever used a scanning electron microscope (SEM)?

Test one out in the material development exhibit and get up close and personal with the inside surface of a hydraulic cylinder.



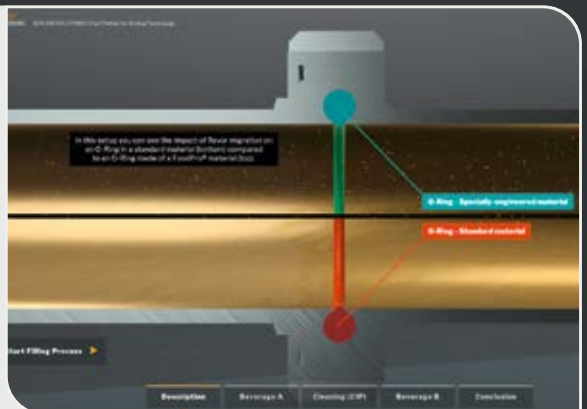
How does sealing technology improve assembly processes?

Install a gasket into an electric controller in the multicomponent technology exhibit to learn how a fully bonded, three-component part optimizes the assembly process while ensuring a tight seal.



Do you know how seals prevent flavor carryover?

In the FoodPro® materials exhibit, see how specially engineered materials minimize flavor carryover, reducing water consumption and costs for beverage bottlers.



BEHIND THE SCENES



Gaming technology brings seals to life

The virtual showroom is based on WebGL (short for web graphics library), a powerful web animation technology. It developed out of demands from the gaming industry, which needed something more than static web content with embedded images.

What makes WebGL unique is that it functions across all web browsers. Mozilla and Opera piloted initial

experiments rendering 3D graphics and based on these, the wider community formed a consortium to standardize a technology that every browser could implement.

WebGL gives visitors the ability to step into the showroom and interact with exhibits. For example, in the Lubrication Management exhibit, you can zoom into and cut open a hydraulic cylinder to understand the numerous benefits this technology offers.

Engineered Polymer Solutions

Working with you to develop products based on high-performance thermoplastics and processes, backed by decades of design and manufacturing expertise.

SUSTAINABLE



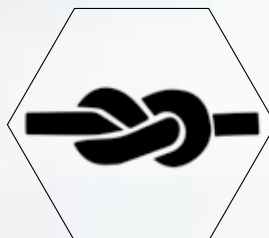
Contribute to fuel reduction, energy efficiency and sustainability

MULTI-FUNCTIONAL



Add and enhance material properties or consolidate multiple parts into one

STRONGER



Impact resistant with high strength to replace structural elements

LIGHTER



Half the density of aluminum and a sixth of that of steel



MORE INFORMATION

Download the brochure to find out more:



THERMOPLASTICS HAVE OFTEN BEEN thought of as ‘out of reach’ for many applications due to the cost of development. But recent advances in manufacturing, simulation and materials have made composite parts available for applications in a diverse range of industries, including robotics, aerospace, oil and gas and semiconductor fabrication. “Stronger, lighter, more sustainable and consolidating multiple functions into a single part are the key advantages to using thermoplastics,” says Brian Richards, Director of Global R&D Business Development at Trelleborg Sealing Solutions, “with the latest techniques and materials, we’re aiming to bring these benefits to more applications.”

Thermoplastics are lighter than aluminum and steel, but with high strength and impact resistance. Surprising to some, this has enabled them to replace structural components within aerospace.

“Thermoplastic parts can be 40% lighter than aluminum and 70% lighter than steel, without compromising on strength,” says Brian. “We’ve designed ribs, brackets and retainers for aircraft that are lighter and stronger, but also reduce assembly steps to lower the cost of secondary operations.”

With the array of different thermoplastic materials available, the parts can be found across aircraft, including within the engine and interior. “We can tailor the properties of materials

“Thermoplastic parts can be 40% lighter than aluminum and 70% lighter than steel, without compromising on strength.”

BRIAN RICHARDS,
*Director of Global R&D Business Development,
Trelleborg Sealing Solutions*



to an application, making products that are media compatible with oils and coolants and that resist high temperatures, meeting nearly any requirements.”

“Regardless of the industry, thermoplastics have something to offer,” continues Brian, “whether resisting the harsh chemical environments encountered in downhole oil & gas tools, reducing friction and stick-slip when moving robotic arms, or even color matching an aircraft’s interior trim.”

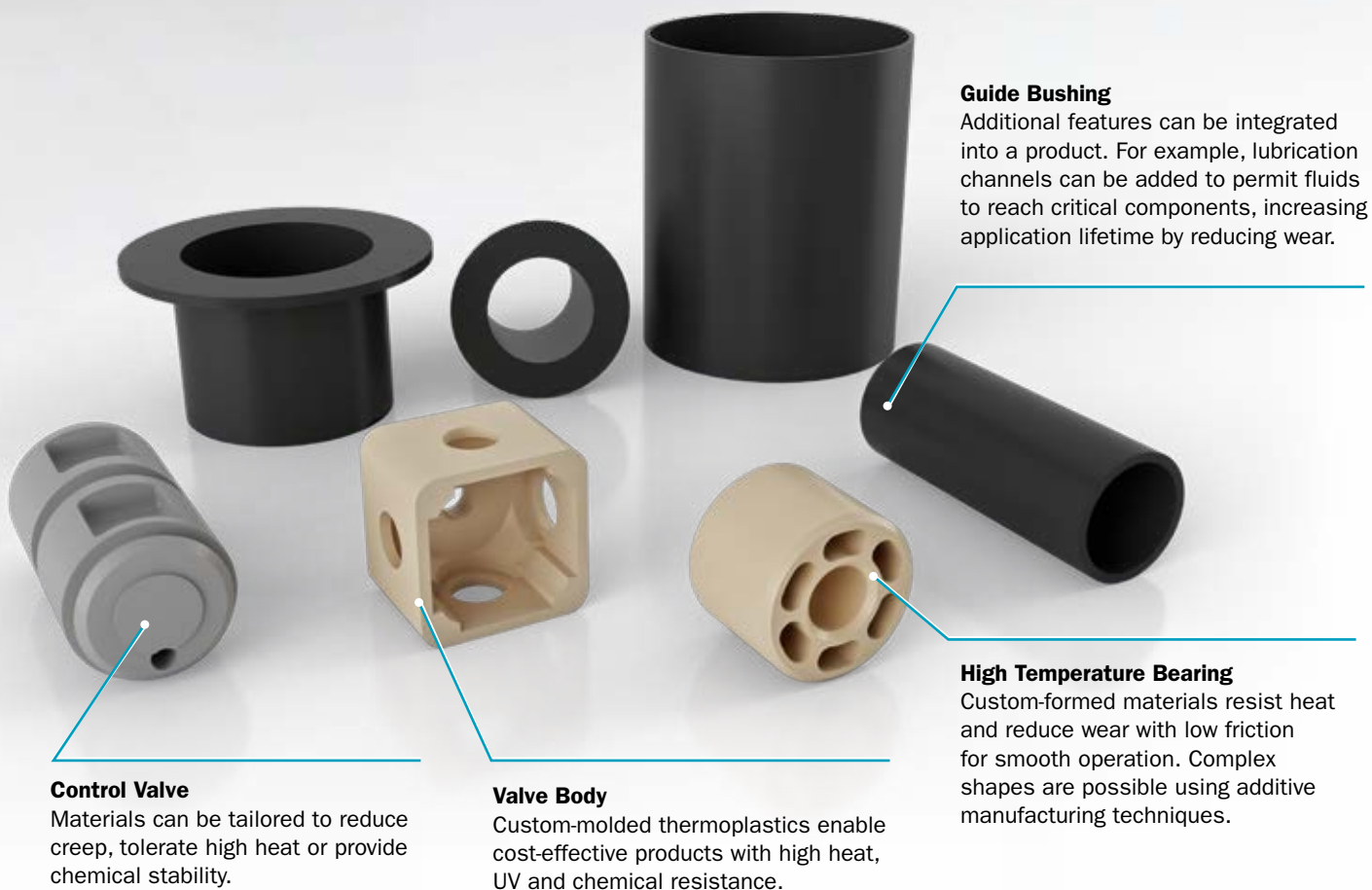
With such a wide variety of options, choosing an experienced development partner is essential, especially to reduce development time for new products and to keep pace with accelerating innovation cycles. We’ve made significant investment in new equipment, such as additive manufacturing and multicomponent component manufacturing. “Both bonding and two-shot manufacturing enable us to provide the correct performance in the correct place, with dissimilar materials strongly attached to one another, behaving as a single product,” says Brian.

Not only is waste reduction during production being studied, but the whole product lifecycle must be understood.

“Sustainability is important to us too, and we aim to integrate green opportunities into both our products and processes,” says Brian. “Products are not developed without a plan for mitigating waste at each stage – it’s not enough to just look at manufacturing.”

To support its customers in bringing products to market faster, Trelleborg Sealing Solutions has invested in a High-Performance Thermoplastics Technology and Development Center. Focused on formulating novel compounds, with complementary design and processing competence, the center develops and refines Trelleborg’s thermoplastic materials portfolio and engineers new products. “We offer testing and engineering support for our customers, with a full suite of AI and Computation Engineering optimized design services, all under one roof – making the production and validation process as quick and effective as possible,” says Brian. →

SOLUTION SHOWCASE



Control Valve

Materials can be tailored to reduce creep, tolerate high heat or provide chemical stability.

Valve Body

Custom-molded thermoplastics enable cost-effective products with high heat, UV and chemical resistance.

Guide Bushing

Additional features can be integrated into a product. For example, lubrication channels can be added to permit fluids to reach critical components, increasing application lifetime by reducing wear.

High Temperature Bearing

Custom-formed materials resist heat and reduce wear with low friction for smooth operation. Complex shapes are possible using additive manufacturing techniques.



Fastening/Insert Molding

Integrating mounting features reduces assembly effort and overall component size. The resulting products are lightweight, strong and long-lasting.



Multicomponent

Thermoplastic connectors provide excellent performance in extreme conditions. Simultaneous and secondary over-molded covers meet a diverse range of needs.



Bonded Products

Trelleborg uses specialized techniques to enhance adhesion and bonding. Thermoplastics, metals and elastomers can be combined to integrate different properties and features within the same component, consolidating parts, simplifying assembly and adding additional features.



Motor Mount and Housing

Additive manufacturing enables Trelleborg to create highly customizable structural components. Their strength can support the weight of robotic arms and keeps them steady in operation.



Next Level Sustainability Starts with Design Thinking.

One way Trelleborg Sealing Solutions is Protecting the Essential is by incorporating sustainable methods into our design, manufacturing, and production practices, through Design Thinking for Circularity.

By Sophie Hudson

Until recently, sustainability has primarily focused on recycling and energy usage, and for a long time, our economy was linear. This means we take the resources we need, make a product, use it, and then, at the end of its life, dispose of it.

For Trelleborg, at the forefront of sustainability is the concept of product circularity and a circular economy. Circularity is more than developing a product that can be recycled, it is about designing extended value into a product, for the customer, for their customer, and for first, second, and even third users of the product. It is not a step-by-step process with a clear end, but a continuous cycle.

The Circular Economy

We consider the circular economy in the design phase of our products, materials, and solutions. We understand that the traditional linear economy approach to manufacturing - taking a raw material, making it into something, and disposing of it when finished - is unsustainable. Creating circular products that last longer and use less energy, can be repaired, refurbished, or recycled, and have a useful second life, supports the circular economy and sustainability.

Design Thinking for Circularity

As opposed to a disposable design, where there is no consideration of what will happen to the product after the end of its design life, design thinking for circularity is an important shift in the way we develop products. It is how we think about product design from the very start, with a desire to develop seals that are part of the circular economy and designed with the environment and sustainability in mind. Design Thinking for Circularity is not about designing a product for recycling, instead, we design seals that last longer, use less energy and support easy repair and replacement. →



WHAT IS A CIRCULAR ECONOMY?

Traditionally in manufacturing, we take materials from the earth, and use them to make products that at the end of their life we throw away — the process is linear. In a circular economy, our aim is to reduce waste through the reuse, recycling, and repurposing of a product. At Trelleborg, we do this through Design Thinking for Circularity.

MORE INFORMATION



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



Below we look at each design focus area and discuss how we are designing our products for a circular economy.



Design for Performance

We create high-performance seals with a long life, so customers need to replace them less. This results in less waste, reduced raw material use, and a greater return on investment (ROI).

High-performance starts at the design phase. We model seal performance through Finite Element Analysis (FEA) and simulations across a range of application conditions and materials; this allows us to modify designs prior to testing to reduce the number of prototype loops, lower development costs, reduce material waste, and speed up time to market. Our testing ensures our seals will perform as expected in an application.



Design for Repair

If you can't repair it, it can't be reused.

Utilizing predictive maintenance tools during the design phase of a seal, we work with our customers to design solutions that can easily be disassembled to enable parts to be repaired. Seals that are easy to remove and replace reduce damage to equipment and lower downtime.

Interesting Facts

- The earth takes almost 1.5 years to regenerate what we use in a year¹
- 80% of waste from consumer goods, after burning, goes to a landfill because of poor design or lack of end-of-life collection options¹
- Over 80% of a product's environmental impact is determined at the design stage¹
- Currently, only 9% of our world economy is circular¹
- 60% to 70% of the world's ecosystems are degrading faster than they can recover²
- We recycle less than 20% of electronic waste²
- Recycling electronics uses less energy in production and conserves resources like copper and aluminum.²

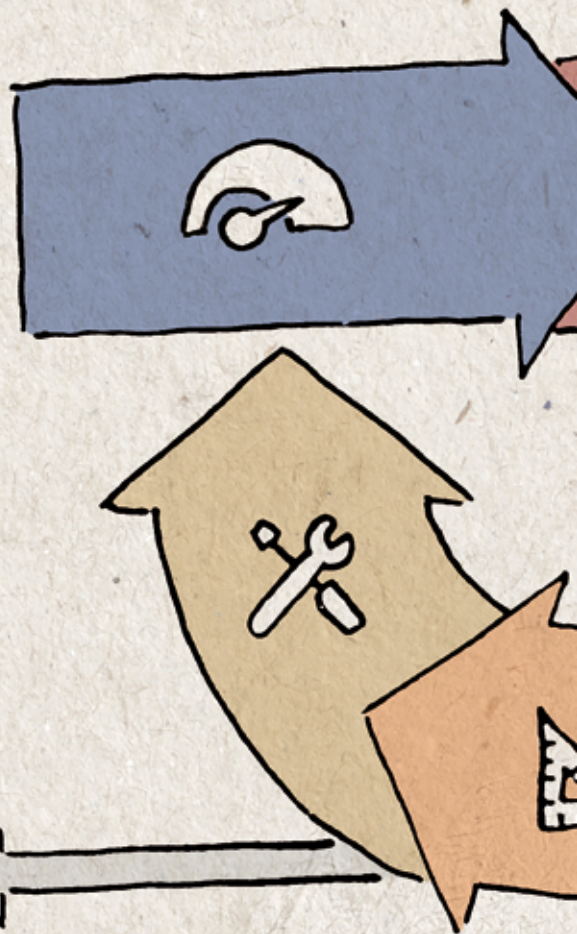
¹ <https://www.trvst.world/environment/circular-economy-facts-statistics/>

² <https://www.trvst.world/environment/sustainability-facts-statistics/>

Design for Minimal Waste

The less we put into landfill, the better.

The methane gas released as waste decomposes in landfill creates a greenhouse gas that contributes to global warming and climate change. We design our seals to last as long as possible, reducing the need for replacement parts and waste put into landfill.





Design for the Environment

Where possible, our raw materials come from sustainable and renewable sources. Regrinding of production waste into a material blend for non-critical components, gives this a second life, reducing material sent to landfills.

By creating virtually leak-free seal designs, we minimize the risk of contamination to ground and water resources, protecting the environment from contaminants. The extended product life of our seals has a clear impact on sustainability. The fewer parts that need to be replaced, the fewer consumables and raw materials we use. The transport and logistics involved in moving parts and people to remote locations have a massive impact on the environment, by extending product life, we reduce CO₂ emissions in the supply chain.



Design for Energy Efficiency

Trelleborg's Lubrication Management Technology reduces friction, wear, and heat generation in linear tandem sealing applications by allowing just the right amount of fluid film to reach the secondary seal and prevent dry running conditions. This reduces the energy required to power the system and can support the downsizing of drive components, in turn reducing the overall amount of energy used by equipment.

In rotary applications, we use our Turcon® Roto Variseal®, a single-acting low friction seal with no stick-slip. The seal provides long-lasting seal efficiency and can withstand dry-running conditions. When compared to a standard radial oil seal, the low friction characteristics mean the seal uses less energy and lowers the risk of environmental contamination as a result of premature failure.

“By reducing friction in an electric vehicle, for example, we can extend the drive time of the vehicle. The principle is the same in standard industrial applications, if we reduce friction, less energy is used.”



Design for Modularity

Utilizing industry-standard design profiles and sizes ensures designers and end-users can easily specify sealing components, allowing the reuse of hardware designs. Standardization supports ease of repair, refurbishment, and reuse with readily available replacement parts, to give the hardware a second or third life.

MICHAEL COOK,

*Global Segment Director for Off-Highway &
Segment Manager Fluid Power in the Americas,
Trelleborg Sealing Solutions*

Here are some examples of circular product designs from Trelleborg:


Next-generation Central Tire Inflation Systems

Central Tire Inflation Systems (CTIS) adapt tire pressure by inflating or deflating the tire to ensure the optimum level of traction for surface conditions. This results in a reduction of around 5% to 10% fuel consumption and improved sustainability. Our Turcon® Roto L seal is the first-ever active seal for the rotary swivel joint in the CTIS, designed to only seal during tire pressure adjustment to conserve energy. The seal extends the lifetime of a CTIS by lowering friction, saving energy, and reducing fuel consumption. Future sealing solutions for CTIS include a custom-made elastomer molded seal housing, to remove the need for aluminum housings and additional static seals. Our latest designs incorporate air channels to direct the flow of air through the CTIS and these are customizable to meet individual axle requirements.

Lightweight Advanced Composite Materials

Our unique Automated Fiber Placement (AFP) technology is part of a specialist continuous-fiber manufacturing process that produces strong, lightweight components for a wide range of applications. This technology uses thermoplastic composite materials that are recyclable and suitable for repurposing at the end of life, unlike traditional thermoset composites.

Organically Sourced Materials

The development of bio-friendly materials using renewable plant-based compounds such as sugar cane and natural oils is something we are exploring. These materials could allow us to create unique sealing solutions that not only provide high-performance sealing with a long life but also use less energy and have a significantly reduced carbon footprint during manufacturing. 

SERVICEPLUS COMPLETES THE CIRCLE



ServicePLUS is a total solution program that can simplify the workflow in every part of your value chain. Our enhanced services match your needs to ultimately reduce total costs and throughput time. This includes:

- Outsourced manufacturing of subassemblies
- Part repair kits, or kitting, for easy repair and replacement
- FEA and simulation engineering support services
- Reduced wastage through vendor managed inventory control



Scan the QR code to find out more.

EVERYDAY EXAMPLE OF A CIRCULAR MATERIAL

Bamboo is just one example of a raw material that is already in use in the circular economy. Bamboo is a diverse group of evergreen plants that is fast-growing and regenerates quickly, therefore it's considered a renewable resource. During growth, bamboo produces more oxygen than other trees and can absorb a large amount of carbon dioxide from the air, supporting the reduction in ozone gases.

Natural bamboo can be a great substitute for plastic in many household products, for example, single-use bags, straws, cups and plates, toothbrushes, packaging and food containers, clothing and textiles, and even furniture and flooring. At the end of their useful life, bamboo products can be composted, easily recycled, or even repurposed.

“Reuse is so important, too often we throw things out after we’re done using them, when in reality those products can have second or third useful lives. The idea behind a circular economy and circular products is for those products to find another life – sell it, donate it, repurpose it, reuse it – anything you can do to extend the life of the product.”

DAVID KALEY,
Business Development Manager,
Trelleborg Sealing Solutions Americas

Turning Up the Heat

Seals are very small and their importance in equipment is often underestimated. In food and beverage processing equipment, they play a vital role in ensuring consumer safety, while keeping equipment running.

By Meghan Cloud Braunger



FOODPRO® EPDMs

Specially engineered to meet the unique requirements of the food and beverage industry, FoodPro® EPDMs are compatible with harsh cleaning and sterilization processes and compliant with the most comprehensive global food contact material regulations.

Three revolutionary materials

FoodPro® E75F2 – For universal use



Extremely versatile – Suitable for a wide range of applications – Good dynamic properties

FoodPro® E85F2 – Designed for high pressure applications



Enhanced extrusion resistance – Good dynamic properties

FoodPro® E75F1 – Suitable for use with infant formula



Low levels of carbon black – Meets strictest regulations – For static and semi-dynamic applications

LARGE FOOD PROCESSING MACHINERY, like a bottling line, contains hundreds of seals. They are found in pumps, valves, fillers and at joints and flanges and perform numerous functions. They prevent leakage and contamination of the food product, help facilitate hygienic design by filling gaps and improving performance, protect hardware and help maintain effective lubrication of moving parts. In all these functions, seals have contact with the processed food product, as well as cleaning media, making specification of the optimum sealing material very important.

A Thorough Cleansing

After a filling process is completed, the equipment must be thoroughly cleaned to ensure product quality and purity and maintain a hygienic environment. Ana Lucía Vásquez-Caicedo, Global Technical Manager for Food, Beverage & Water, explains the importance of effective cleaning processes. “After a food or beverage has been processed, the equipment is very dirty. Even after a rinsing, significant amounts of residue can still be found. It is vital to remove all traces of the food. If particles remain on any surface, microorganisms can grow, which can spoil food, reduce shelf life and be a risk to consumer safety.”

Automated Cleaning-in-Place (CIP) and Sterilization-in-Place (SIP) systems are commonly used to clean food processing equipment. A typical CIP process consists of a pre-rinse

cycle to remove dirt, followed by wash cycles at elevated temperatures using aggressive cleaning agents to remove organic matter, and then a series of rinse cycles to remove traces of the cleaning agents and sanitize or disinfect the equipment.

Hot and Harsh

“Seal materials always come into contact with cleaning media and CIP processes can quickly damage seals,” says Ana Lucía. “In applications with higher loads or pressures, rapid deterioration is a real danger. Matching seal material to processed media, cleaning chemicals and the operating environment is critical to reduce risk to consumers and minimize downtime for maintenance.”

Trelleborg Sealing Solutions material engineers conduct immersion tests to verify compatibility of materials with cleaning solutions. Material samples are placed in special jars and covered with CIP fluid. The jars are placed in an oven and stored for several weeks at a defined temperature.

“As part of the material development process, our newly launched FoodPro® Ethylene Propylene Diene Rubber (EPDM) materials were tested in numerous cleaning media.” Ana Lucía explains, “tests included a two percent sodium hydroxide solution, which is commonly used in the first wash cycle to remove remaining food particles. To test our materials to the



The Hottest Spot in Stuttgart

Our material laboratory in Stuttgart, Germany houses an entire wall of ovens! Trelleborg Sealing Solutions R&D facilities around the globe are equipped with material laboratories to facilitate in-house testing.

“After the seals are removed from the oven, we inspect them in a series of tests to evaluate the impact the CIP fluid and heat had on the material.”

ANA LUCÍA VÁSQUEZ-CAICEDO,

Global Technical Manager for Food, Beverage & Water

extreme, we placed the seal material in this solution and stored it in an oven for three weeks at 140 °C / 284 °F.

“After the seals are removed from the oven, we inspect them in a series of tests to evaluate the impact the CIP fluid and heat had on the material. For example, we look for changes in hardness, weight and volume, tensile strength and compression set.

Better performance

“By fully testing materials for compatibility with cleaning processes and for compliance with food contact regulations, we aim to provide our customers, and also their customers, with solutions that optimize the performance of their equipment.” Ana Lucía concludes, “this helps food and beverage processing companies reduce costs and conserve energy and water. Their machines can operate longer, food waste is minimized, and processed foods are safe for consumers.”

MORE INFORMATION



Learn more
about our
FoodPro®
EPDMs

TESTING FOR REGULATORY COMPLIANCE

Alongside testing for compatibility with CIP and SIP processes, FoodPro® materials undergo extensive tests to ensure they are compliant with global food contact regulations.

Trelleborg Sealing Solutions R&D facilities are equipped with gas chromatography-mass spectrometry (GC/MS) devices to support migration and extraction testing in accordance with regulatory requirements.

Conduct a Migration Test

Take a closer look at how this works in the Virtual Showroom. You can analyze a seal material in a step-by-step process using GC/MS equipment and see if it meets regulatory requirements and is safe for consumers.



Visit the Virtual Showroom to find out more about how we ensure materials are compliant with global food contact regulations.

Keep on Trucking

The D-Seal combines sealing and damping within a single product to eliminate cavitation damage in diesel engines and transmissions.



THE RUMBLE AND HUM OF A DIESEL ENGINE is a familiar noise to most people. As a mixture of fuel and air is added to the piston, it is compressed, causing it to ignite spontaneously, increasing pressure within the cylinder rapidly and providing the power necessary to move even large vehicles. Due to their efficiency, they have often been the engine of choice for heavy-duty trucks and other large vehicles but they tend to be loud and create vibrations.

“Some of the noise and vibration from a diesel engine is not necessary to its function. It can in fact represent wasted energy and inefficiencies within the engine,” says Peter Astrom, Product Manager at Trelleborg Sealing Solutions. Engineers have created many different solutions to reduce these vibrations: through changes in component design, additives to oil and soundproofing. Part of this noise can derive from a process known as cavitation, occurring within the cylinder.

Within the engine, cylinder liners form a sliding surface for the piston rings and retain lubrication. Vibrations, in addition to standard pressure variations, lead to cavitation damage. Drops in pressure cause bubbles to form within the fluid that rapidly expand and then collapse, eroding the liner, and leading to leakage and eventually engine failure. “After studying the


specific conditions leading to cavitation, we aimed to design a seal to eliminate this kind of damage entirely,” says Peter.

Typically, O-Rings are used for this kind of application, but Trelleborg Sealing Solutions quickly realized that a better solution could be found. That new solution is called the D-Seal.

“What’s special about the D-Seal is that it combines both sealing and damping into one product,” says Peter. “In testing, it completely eliminated cavitation damage.”

Several unique features combine to prevent vibration, while maintaining strength and rigidity. The profile of the seal is either single or double-D shaped, forming sharper edges against the cylinder lining, fitting firmly into the housing and preventing cavitation. The shape also serves to increase the mass of the seal and more evenly distributing pressure, improving sealing efficiency. With no parting line from manufacturing, there is no weak point across the circumference of the seal.

D-Seal can be customized with different materials and coating options to meet a multitude of requirements. “The seal doesn’t twist in the groove and is easier to install than an O-Ring, with treatments to reduce required assembly forces available.

This allows automated assembly, reducing secondary operations and improving manufacturing efficiency,” says Peter. The seal is already in use with cylinder liners, tube fittings and flange seals, improving service life and efficiency. “Improving performance is a key part of Trelleborg’s offering. However, we do not want to just specify the right seal but look to where we can add extra value or improve performance in ways that are not necessarily immediately obvious,” finishes Peter. 

FEATURES AND BENEFITS

- No parting line on the sealing surface, removing join failure risk and leak path
- Robust and rigid design, customizable to conditions
- Simple and stable assembly; no twisting in the groove and suitable for automatic handling
- Wide choice of industry-approved materials optimized for specific characteristics, including temperature, pressure, and media resistance
- Available with color-coding to avoid mixing of parts and aiding identification or camera detection
- Proprietary coating options to reduce assembly forces and eliminate lubrication during installation
- Excellent sealing properties for static and semi-dynamic conditions
- Damps vibrations and prevents cavitation damage to cylinders

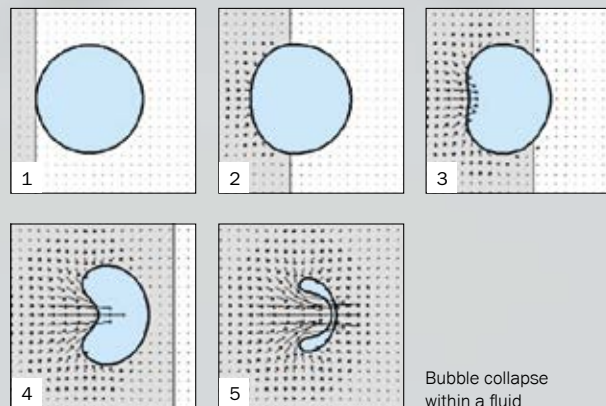
D-Seal combines sealing and damping into a single product to give leak-free, long-lasting performance within diesel engines and powertrains.



Scan to learn
more about
D-Seal

WHAT IS CAVITATION DAMAGE?

Hydrodynamic forces, such as fluctuations in the complex pressure profile encountered within engines and pumps during operation, can cause gas bubbles to form in liquids. If the pressure of a fluid becomes lower than its vapor pressure, it will ‘boil’ and form bubbles. This part of the process leads to excess vibrations and noise. When the pressure increases again, the bubbles collapsing produce shock waves with immense pressure that can rapidly erode metal housings and create leak paths, leading to seal failure.



FoodPro® EPDMs

Ensure Safe Sealing In Food Processing

now



Specially engineered for use in food and beverage processing applications

The new generation of FoodPro® EPDM materials demonstrates compliance with the most comprehensive global food contact material regulations, is suitable for use with virtually all food and beverage products and is compatible with harsh cleaning and sterilization processes. For manufacturers of food and beverage equipment, FoodPro® EPDMs save time and costs by making it easy to specify materials that work in their products globally.

Scan the QR code to learn more about the material family

