No. 1, 2012

Trelleborg Sealing Solutions

in the groove

The world of seals and service

Automotive

Uniquely Layered

Increasing demands call for unique and innovative solutions. Trelleborg Sealing Solutions takes a traditional product and sets a new standard. Our heroes will show you how you can benefit from Rubore® seals.

Life Sciences

Healthy moldings

Strengthening life science capabilities through expansion and expertise

Innovation

Rewarding new ideas

Trelleborg launches the Trelleborg Sealing Solutions Innovation Award

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Automotive

Uniquely Layered

The automotive industry is continuously demanding more economical solutions from its suppliers. Some respond by just cutting costs and prices, but Trelleborg's approach is very different, instead focusing on innovative solutions. The Rubore® technology is unique. It offers an advanced technique to create a two-to-five layer, rubber-metal sandwich that gives customers real sealing benefits.

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Life Sciences

Healthy moldings

Life science is a key area of focus for Trelleborg Sealing Solutions and investments in this sector are consolidating our world-class position in silicone moldings for this fast growing industry.

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Innovation

Rewarding new ideas

Trelleborg launches the Trelleborg Sealing Solutions Innovation Award.

This PDF file is interactive.

It contains internal and external links that are clickable. They simplify the navigation and lead you directly to the referenced resources (articles, website, films, etc.).

Via the back button on the bottom of each page you can easily go back to the contents of the magazine.

Externernal link Download Zoom in Play film

Facility opening

New facility in Bangalore, India

In April, Trelleborg inaugurated a newly constructed facility in Bangalore, India, to develop, manufacture and supply high-performance sealing solutions for aircraft, off-highway equipment, trucks and passenger cars, as well as for industrial applications. Part of the Trelleborg Sealing Solutions business area, it will initially employ around 300 people, with the number increasing in the near future.

Long-term growth opportunities

"We believe that India has highly favorable long-term growth opportunities, and our strong global platform will be further reinforced by this facility," says Trelleborg President and CEO Peter Nilsson. "This unit continues our commitment to the growing manufacturing sector within in India."

Favorable demand

"This state-of-the-art facility will help us to further improve our offering to industry in India and enables us to locally manufacture high-technology products currently being offered to our global customers," says Bony Paul, Managing Director, Trelleborg Sealing Solutions India.

Trelleborg in India

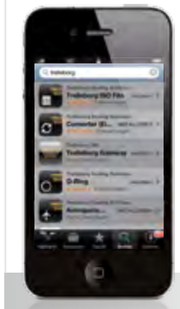
Trelleborg has three facilities in India, in Bangalore and Noida. These develop, manufacture and supply hydraulic and pneumatic sealing systems for fluid power, automotive and aerospace among others. In addition, there are eight regional sales and support offices to effectively cultivate the local market, as well as a center of excellence for engineering and design in Ahmedabad. Trelleborg has approximately 1,000 employees in India and sales in 2011 amounted to approximately INR 3000 Million (61 million USD).

Continuing expansion within India, the inauguration of a new Trelleborg Engineered Systems facility, also in Bangalore, is planned for later in 2012. This facility will develop, manufacture and supply industrial antivibration systems with a focus on rail and molded components for a variety of industry segments.

Service

Trelleborg knowledge on the go...

Trelleborg Sealing Solutions continues to make the engineer's working life easier. With six user-friendly apps sporting a 4 to 5 star rating (excellent feedback), 400,000 downloads and more than 800 app store reviews, the popularity and ingenuity continues to grow. From selection apps to unit and hardness converters, these must-have apps have proven to be a perfect companion while on-the go. Read more on **page 30**.



Product

New HiMod® FlatSeal™ 17 extends existing offering

Trelleborg Sealing Solutions HiMod® FlatSeal™ range includes best-in-class gaskets that complement Trelleborg's market-leading sealing product offerings.

HiMod® FlatSeal™ 17 is based on an innovative blend of high-quality aramid fibers, special functional fillers and Nitrile rubber (NBR), combining the characteristics of fiber gaskets with the positive properties of elastomers. It shows excellent adaptability to unevenness at minimum surface pressure levels, very low leakage even at extremely low surface pressures and good resistance to media and aging.

The improved performance of HiMod® FlatSeal™ 17 steadily increases as the pressure rises and is substantially better than conventional fiber gaskets, with respect to leakage properties, almost reaching the levels of elastomer seals.

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Exhibitions

Experience our capabilities

A trade show event is a perfect venue to create an experience and make a connection with a current or potential customer. An experience can be as simple as displaying products, explaining a benefit or even, more importantly, educating an end user on a product application.

In May this year, Trelleborg exhibited at the Offshore Technology Conference held in Houston, Texas, U.S., one of the most significant events for the Offshore industry. Trelleborg's presence at the four-day show made an impact with its seven in-booth "interactive" presentations, providing up-to-the-minute information on its products and material engineering focus. Finite element analysis and Norsok M-710 approved materials were the two topics Trelleborg Sealing Solutions presented.

All the white papers that were released following the presentations at OTC are available for download by visiting **www.tss.trelleborg.com/OTC2012.**

Visit us at upcoming industry trade events!
The list below provides information on our industry events:

ISC 17th International Sealing Conference	Sept 13-14	Stuttgart, Germany
HUSUM Wind Energy 2012	Sept 18-22	Husum, Germany
IZB Wolfsburg	Oct 10-12	Wolfsburg, Germany
SEMICON Europe	Oct 12-13	Dresden, Germany
PTC	Oct 29-Nov 01	Shanghai, China
Elmia Subcontractor	Nov 06-09	Jönköping, Sweden
COMPAMED 2012	Nov 14-17	Düsseldorf, Germany
BAUMA 2012	Nov 27-30	Shanghai, China
Semicon Japan 2012	Dec 5 –7	Chiba City, Japan
International Motorsports Industry Show	Dec 6-8	Indianapolis, Indiana USA

Exhibitions

Making our presence known in the off-highway market

Bauma China is the biggest trade fair for construction machinery, vehicles and equipment in Asia. Over 1,900 companies will exhibit this year, and the event will take up the entire site at the Shanghai New International Expo Center (SNIEC), an area totaling 300,000 square meters/ 3,229,170 square feet.

Trelleborg Sealing Solutions will be exhibiting the latest sealing solutions for construction machinery and fluid power, as well as newly developed cutting edge technology in the industry. Trelleborg Engineered Systems will demonstrate its antivibration solutions for off-highway vehicles and equipment.

Dates: 27-30 November 2012

Location: SNIEC, Shanghai, China

Stand No.: N2.345

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Further details on the Trelleborg Sealing Solutions Innovation Award and how to submit ideas can be found by going to

www. seals-innovation.com

Rewarding new ideas

Trelleborg launches the Trelleborg Sealing Solutions Innovation Award

Aiming to continue to pioneer new sealing developments, ideas are being sought that can provide engineering solutions for today and tomorrow. The competition is open to anyone, with prizes for the best submissions.

The philosophy behind the award is that everything around us started with somebody having an idea. That idea then needs to be taken and made into reality, to form it into something tangible. The scope of the award is broad so that innovation suggestions are not limited.

Why not visit our innovation site? Not only will you find information on the award but also details of some of our latest innovations.

www.seals-innovation.com

Innovation: A core value

Director Global Marketing and Communications, Trelleborg Sealing Solutions, Robert Zahiri, says: “Open Innovation is one of Trelleborg’s core values and we know that there are lots of ideas out there that can add value to existing applications today and those in the future. We’re not just interested in suggestions for products and materials but anything that relates to improving our business or the way we do business, for instance, novel suggestions for online tools, manufacturing processes or logistic related services.”

As well as receiving a 5,000 EUR prize, the winning idea will be converted into a tangible project, if feasible. iPads will be awarded to the ideas in second and third places.

Innovation Award – Questions and Answers

Q: I am always struggling with certain issues connected to sealing when I am designing applications. If I submit them, does that count as an idea?

A: **Yes, certainly. These type of issues fuel our research and development and can be the foundation for new e-tools to make your engineering job easier.**

Q: Our latest design project is a little bit different and has presented some new challenges. Would you like to consider that in the innovation award?

A: **Of course. At Trelleborg most of our new materials are developed to meet new requirements that are specific to applications.**

Q: For me, sustainability is a key issue. I have some ideas of how you could cut waste in the sealing production process.

A: **Please tell us! Sustainability is another one of Trelleborg’s core values and we are always looking for ways to improve sustainability, whatever they are.**

Q: I don’t buy seals but am involved in equipment to produce seals. I’ve some thoughts on how sealing technology could be improved. Is that outside the scope of the award?

A: **Certainly not. The award is broad so that we can capture ideas such as yours.**

Q: Are you interested in suggestions to improve logistics and the way that you supply your product to customers? I’m thinking of different packaging and delivery methods, for instance.

A: **Definitely these are of interest. We’re looking for anything that improves our service to our customers.**

Q: You have some really excellent e-tools on your website already but I’ve some thoughts on other ones. Can I submit those as ideas?

A: **We’d love to know about those. We devote a lot of resources to our e-tools as we know the internet is so important to engineers when developing applications.**

Q: I am often designing applications that use seals and I have views on where the industry may go in the future. Would that be in the scope of the award too?

A: **We’re looking for ideas for today and tomorrow, so these future visions are totally in the scope of the award. Don’t be afraid to submit ideas that are different. Those could be the most interesting!**

Versabar's Claw makes marine salvage operations faster, safer and less expensive.

Weight lifting

Going deep
The Claw retrieves knocked-over platforms without the help of divers.

Company info

Versabar

Founded in 1981 by civil engineer Jon Khachaturian, Houston-based Versabar is the world leader in developing and deploying heavy-lifting solutions. The company has 700 employees in the Gulf of Mexico region and serves a portfolio of international clients, meeting their lifting needs on land and sea, including technically challenging underwater salvage operations to remove old oil-drilling platforms.

Watching the VB 10000 in action is quite a sight. Four giant white C-shaped truss structures with prongs at the bottom, dubbed "the Claw," hang below two massive yellow arched trusses, spanning a pair of barges measuring 22 by 88.5 meters (72 by 290 feet). The Claw is designed to reach hundreds of feet below sea level to remove sunken oil rigs from the seabed, in one piece and in one day. It's also designed to lift the heaviest of loads. Although most oil rigs weigh between 1,000 and 3,500 tons, the VB 10000 can lift 6,000 tons in its current arrangement, and when in double grapple configuration it can lift as much as 10,000 tons.

"It's a game changer," says Paul Van Kirk, Project Engineer with salvage specialist Versabar, which built the Claw. "The industry has never seen anything like it. We can now retrieve platforms that have been knocked over by hurricanes without sending divers down to rig them up. That saves time and money." The Claw made its debut late in the 2011 lift season and performed five of the 40 lifts during that season. Its success has brought an increasing number of lifts for the busy 2012 salvage season, which runs from May through November, says Van Kirk.

Versabar took just eight months to engineer, fabricate, test and deploy its new underwater heavy-lift vessel. The two massive steel gantries, each weighing 1,000 tons, are designed to work solo or in tandem, depending on the type of object on the seabed. The Claw is optimized to require as little underwater preparation by divers as possible, reducing both costs and risks to humans. That's why the industry's Offshore Technology Conference in Houston, Texas, U.S., awarded the Claw its Spotlight on New Technology Award for 2012.

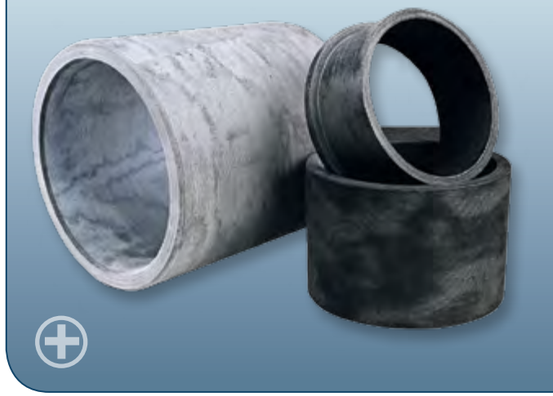
"The materials used for bearings in several key locations are a significant part of the vessel's innovation," says Van Kirk. Its predecessor, the smaller VB 4000, originally used bronze bushings in the critical hinged gantry and barge connection. The bushings required regular maintenance for lubrication, wore out quickly and made a lot of noise. "When we started the design process for the VB 10000 we knew we wanted to use Orkot®," the Versabar engineer explains, referring to a composite material developed and manufactured by Trelleborg. "It's maintenance-free, easy to install, flexible and quiet. It just has a good track record."

The VB 10000 uses Orkot® material for its bearings in the gantry and barge connections and the sheaves in the blocks used to open and close the Claw. "The material is perfect for the job," says Jason LaBorde, Sales Engineer, Trelleborg Sealing Solutions Southwest, U.S. who worked closely with Versabar's engineers to get the heavy lifter built. "Orkot® is designed for heavy loads and slow movements in a seawater environment. It's both resistant to UV rays and corrosion."

Incorporating the material into a new device was a speedy and efficient process, both engineers agree. LaBorde credits Versabar with being "the fastest-moving engineering company I have ever dealt with." The Houston-based company defined the load and other specifications for the VB 10000 and the Claw. Trelleborg's experts provided design input and airlifted the finished bearings to the assembly site on the Gulf Coast. "They were very responsive in helping us finalize our design quickly," recalls Van Kirk. "Trelleborg gave great support after shipping the parts, assisting in their installation."

Orkot®

Orkot® is a lightweight and durable composite material developed by Trelleborg and is used in a wide variety of industries. Being specially formulated for use in sea water, the material is ideal for the shipping and marine industries. The bearings are integral to various applications, including crane masts, rudders, stabilizers and gantries. They have a load capability comparable to metal bearings but are virtually maintenance-free and, as they do not need lubricant to operate, are fish-friendly.



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Eric Bucci, Oil & Gas Segment Manager Americas and Bill Allan, Oil & Gas Segment Manager Europe take a look at the results of an independent report commissioned by Trelleborg.

Offshore is becoming Buoyant

The Oil and Gas industry is an ever evolving market. Hence a global supplier of proven sealing solutions, like Trelleborg Sealing Solutions, needs to be at the forefront of research into new technology and keep abreast of customers' changing demands. A logical move was to commission an independent market research report investigating stakeholders' perceptions of the industry, exploring issues and trends that are shaping the marketplace.

322 senior decision makers across 40 countries took part in the survey, from a diverse array of jobs including engineers and executives, as well as a variety of operating areas such as consulting companies, contractors, and equipment manufacturers.

Balancing Cost & Innovation

Unsurprisingly, the majority of respondents stated cost would be the biggest challenge faced over the next three years, followed by lead times and product quality. "Maximizing productivity is more about balancing costs with innovative solutions that focus on whole life costs rather than just product costs," says Eric Bucci.

"The results also indicated that offshore engineers are under growing pressure to satisfy the emerging needs of customers and enhance their transparency and accountability to stakeholders. Lead times and compliance to stricter approvals, such as API and NORSOK, are becoming more of a concern," says Bill Allan. "In such an environment, the latest technological advancements from manufacturers are an offshore engineer's most powerful weapon." This confirms findings that 87% of respondents think the need for innovation within the industry will increase over the next three years.

In short...

Trelleborg ran a survey into the offshore oil & gas industry:

- Cost will be the biggest challenge over the next three years, followed by lead times and product quality.
- The need for innovation will increase in the future.
- The most common cause of maintenance downtime was the repair of equipment after minor failures.
- Suppliers' sales and engineering representatives are becoming the first port of call when customer's teams have insufficient knowledge to complete design work.
- Over the next three years, investment and subcomponent purchasing is likely to increase.

Specifying the Correct Component is Vital

70% of the offshore sector said the most common cause of maintenance downtime was the repair of equipment after minor failures. "Offshore engineers and managers need to identify operational weaknesses and tackle them head on. Doing this ensures they are working at maximum efficiency, reducing frequency and length of downtime, as well as potentially averting pressure situations such as system failure. Using experienced and quality third-party suppliers and contractors from the outset for guidance and support will help offshore engineers achieve this," says Eric.

By focusing their attention on product options with extended life, engineers and managers can significantly reduce planned replacement requirements, lowering the interval between maintenance and increasing overall efficiency and productivity. By paying attention to what are deemed minor components such as seals, companies can reap the benefits. Whole life costs can outweigh the upfront component cost when procuring subcomponents.

Face-to-face and Online

Trends in supplier choice and information sources are seeing a shifting focus. Nearly 65% of all respondents stated suppliers' sales and engineering reps as their first port of call when their team had insufficient knowledge to complete design work. 63% deemed online sources and tools as a top place to turn for advice and over half of respondents would procure subcomponents directly from a global manufacturer, with local facilities and technical support, as opposed to a local distributor.

"We believe that in order to stay ahead of the competition, manufacturers must make investment into new manufacturing facilities across key regions, as this will bring them closer to the action in this sector. On-the-ground production and technical support is something that customers are coming to know and expect from leading brands, and is something they will look for more," says Bill.

Increasing Optimism

Overall, the results revealed that stakeholders were largely in agreement and positive about the outlook of the oil and gas sector. Nearly three quarters of stakeholders predicted their company's purchase value of subcomponents would increase over the next year, with fewer than 4% stating it would decrease. More than 50% of decision makers claimed investment would increase by 20-30% over the next year, with 17% expecting that increase to be 50-100%. "This purchasing trend is a positive indicator because increasing subcomponent expenditure means greater scope for projects, which will stimulate the industry," says Eric

The results of the research have situated Trelleborg Sealing Solutions in a unique and advantageous position. We have always been keen on discovering new technologies to aid the development of exploration, extraction, refining and transportation within the oil & gas industry, and with 50 years of experience and proven excellence and reliability, this shows no sign of slowing down.

To download the survey report in full go to

www.trelleborg.com

A Global Overview:

Despite the U.S. still leading the world in terms of investment and decision making, the industry is seeing widening and uncertain international spread. This provides additional challenges for suppliers to offer the support operating companies require in emerging areas.

70% of investment in the oil and gas industry is now made outside the U.S. with no particular country or region being dominant

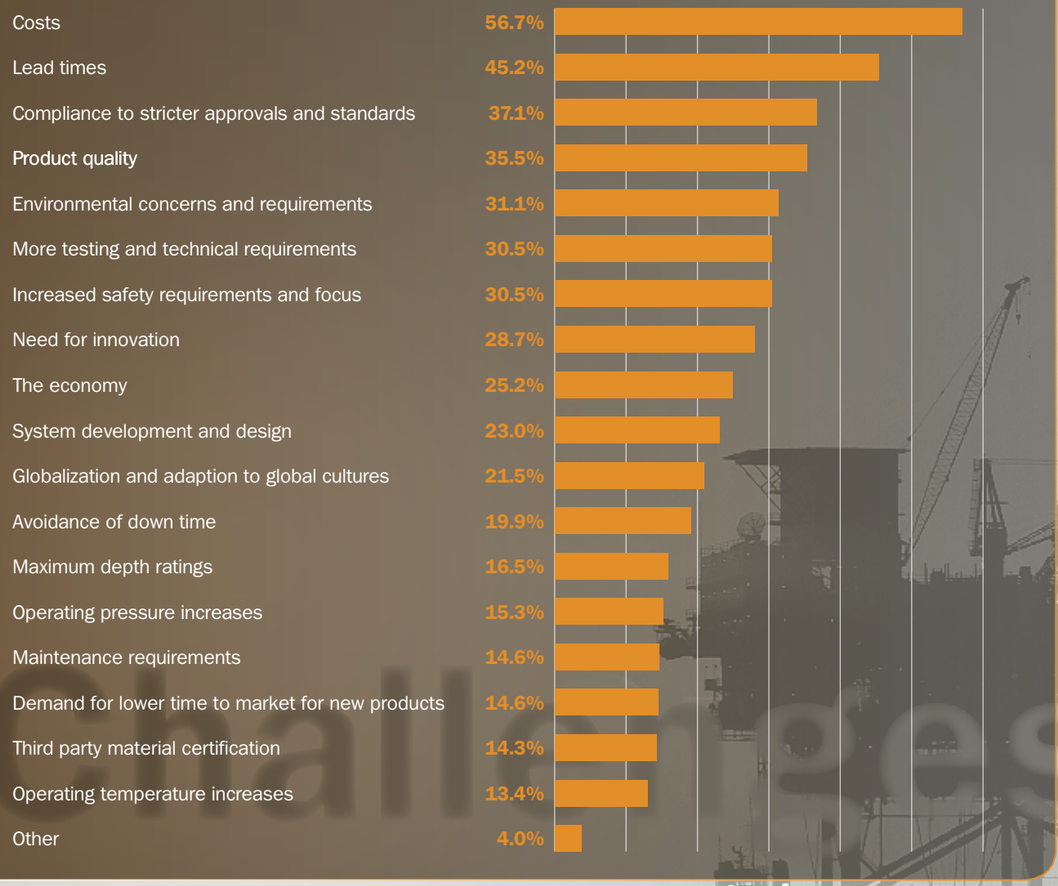
50% of project authority rests in the U.S., however the U.S. is expected to only account for one third of future investment

20% are unsure of future investment location or stating alternative locations for future investments

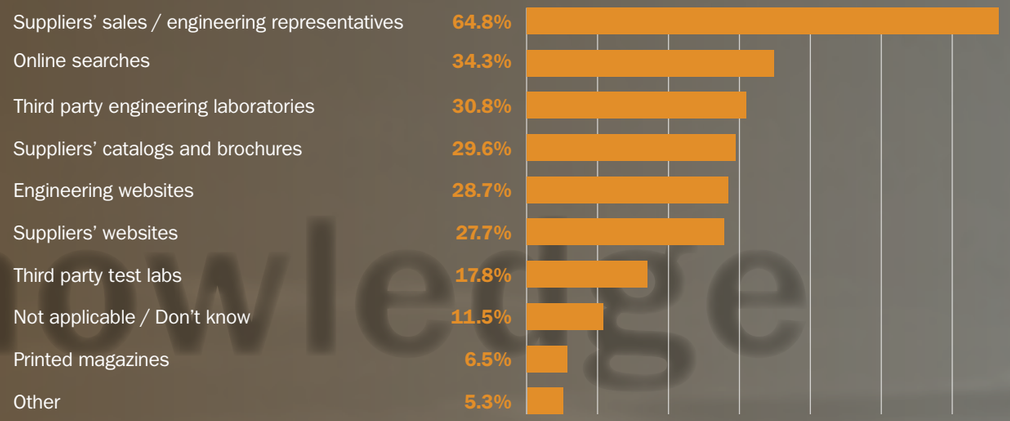
15% Brazil is the second most likely location for future investment, 1 in 5 expecting investment to be made there, 15% believe Brazil will take most of their company's resources

11% expecting investment in Asia in the next three years, 16% think the region will demand the majority of their resources

Which five factors do you expect to create the most challenges in your work over the next three years?



When you do not have sufficient knowledge in your team to complete design work, what are your three main sources of information to solve an issue?



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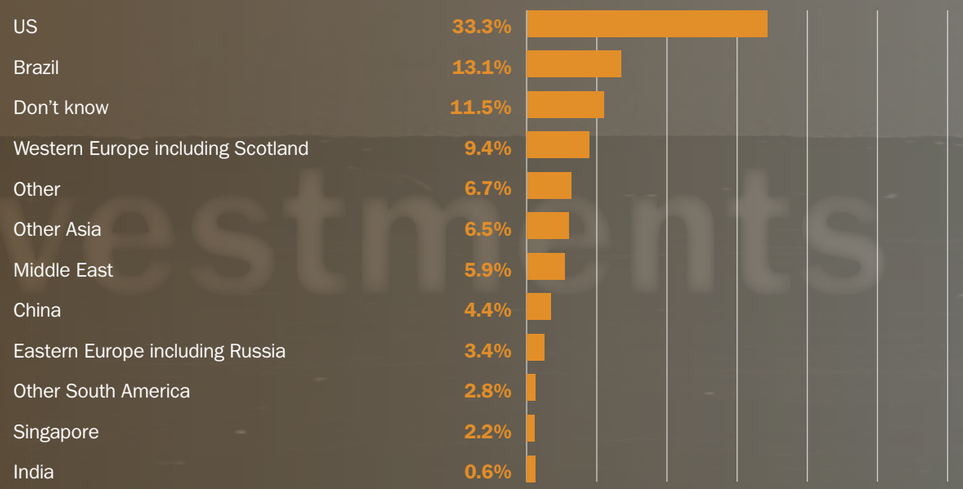
In the next three years where do you expect future investments for projects?



Other Key Findings:

One in four cited environmental concerns and requirements as key challenges over the last three years, with this increasing to one in three when looking forward to the next three years.

More than half of stakeholders revealed that they either had, or would be introducing, material test certification for subcomponent suppliers

More than 80% of stakeholders predict that investment into equipment specifically developed to meet health and safety requirements will increase or increase dramatically over the next three years

Almost 50% of stakeholders rely on the track record and historical success of their suppliers

More than 60% of all decision makers claimed that API standards were by far the most requested

One for all

Standardization of seals pays dividends in terms of cost savings for Canadian hydraulic cylinder manufacturer, Monarch.

Until a few years ago, Monarch Industries struggled to find a way to standardize sealing grooves for its products. The Winnipeg, Manitoba-based manufacturer of hydraulic cylinders, custom metal castings and mixers hoped that standardization would allow it to realize savings by carrying less inventory, since it would no longer need custom versions of the same part for different cylinders.

Four years ago, Monarch invited companies to participate in a seal review project, the goal of which was to replace existing seals in their cylinders.

The engineers at Trelleborg Sealing Solutions were up for the challenge. By utilizing Trelleborg's innovative sealing solutions, Monarch is now able to swap one seal for another without having to change any of the steel components of a cylinder. Heads, pistons and other products have become more standardized.

Rationalization and standardization

"Trelleborg Sealing Solutions has offered Monarch Industries a comprehensive program that focused on technical support, product rationalization and standardization. We were able to provide Monarch with innovative seal designs that focused on optimizing value, advanced seal performance and potential cost savings on processing their hardware components," said Jeff Sloan, General Manager of Trelleborg Sealing Solutions Canada.

With the new program engineered with Trelleborg, Monarch uses one seal size to allow them to exchange different types of seals for various pressures and applications. For example, when using a four-inch piston, only one metal piston seal is needed and can apply across markets since the seals can be interchanged.

Added value engineering support

Since partnering with Trelleborg, Monarch Industries has found added value in their engineering support.

"They have a very technically enabled team in Fort Wayne, Indiana, U.S. that has been able to supply expertise whenever we call for them. They've participated in customer presentations. Their sales team is willing to come out and help our sales team efforts. Support beyond just the product puts them in front of others," said Monarch Product Manager, Mike Dickenson. "Their expertise in support of our sales efforts has helped us win business.

"The system we have now is, in the long run, going to help with our economies of scale… We're going through transitions, and once those changes have been made, we should see some real tangible and intangible profits."

Standardization not standard

Not only was Trelleborg able to present a solution to the standardization problem, but it also created new sealing technologies to resolve issues Monarch has uncovered since then.

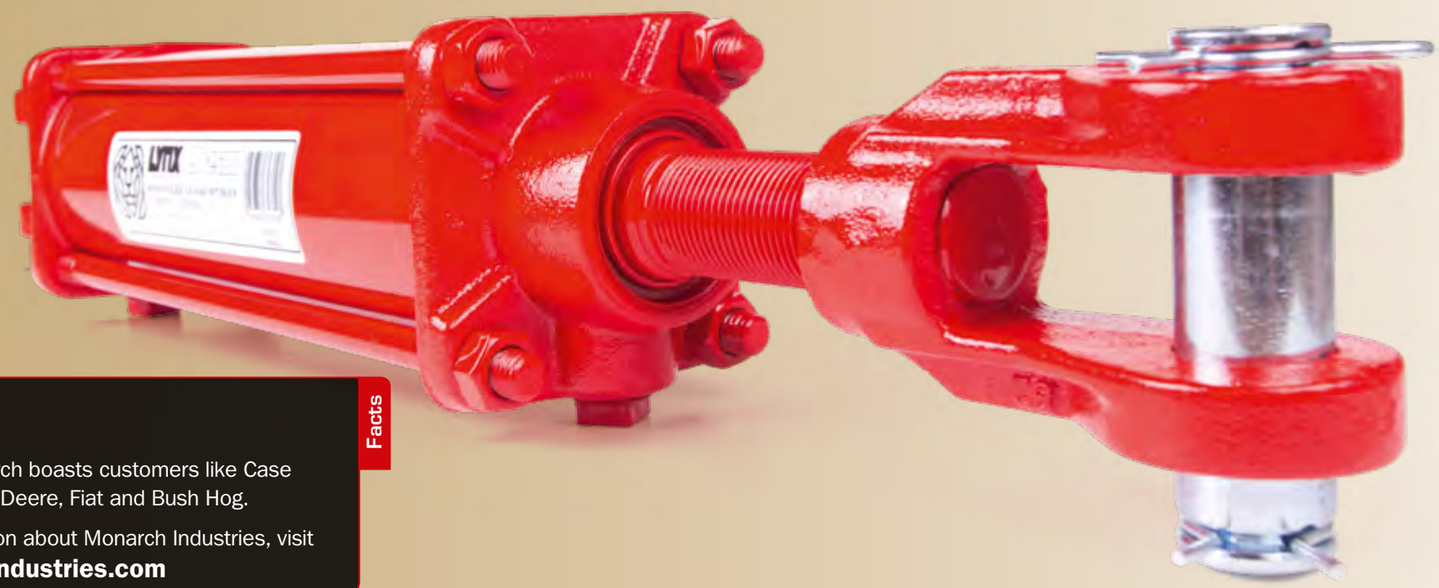
"The success of the Monarch/Trelleborg Sealing Solutions program was largely dependent on the combination of Monarch Industries being prepared to make a significant shift in the design of their hydraulic cylinders and Trelleborg Sealing Solutions understanding their customer's underlying needs and not simply offering a standard sealing solution from their catalog," said Sloan.

Monarch also appreciates Trelleborg's global reach, as Monarch is looking to expand into Europe and China. "With the global infrastructure of Trelleborg Sealing Solutions, we are able to cost effectively bring solutions to those [international] markets," said Dickenson.

Sealing Solutions

Monarch's hydraulic cylinders incorporate a number of different seal types from Trelleborg Sealing Solutions. These include:

- Zurcon® Wynseal
- Zurcon® U-Cup RU9
- Zurcon® Glyd Ring® P
- Zurcon® DA24
- Zurcon® Dualseal
- HiMod® Bearings



Facts

About Monarch

Monarch's hydraulic cylinders are used across a variety of markets, including agriculture and mobile hydraulic equipment. Recognized as one of Canada's 50 Best Managed Companies every year since 1995, Monarch boasts customers like Case New Holland, John Deere, Fiat and Bush Hog.

For more information about Monarch Industries, visit **www.monarchindustries.com**

To standard:

Food, Beverage & Pharmaceutical

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Check out our food, beverage and pharmaceutical movie

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"To standard" is a regular feature covering the various standards that apply to our products in the numerous industries we serve.

Health is important to everyone. From the food we eat, to medicines we take when we suffer from illness, everybody deserves the right to a guarantee of quality. Sealing environments for bioprocessing, food, beverage and pharmaceutical production are probably the most challenging of all. When seal failure can result in contamination or line stoppage, failure is not an option. Trelleborg has a strong position in these industries, and has worked in conjunction with customers to develop not only elastomeric seals but food-contact Turcon® PTFE-based compounds, Zurcon® high modulus thermoplastics and Orkot® thermosetting fabric-reinforced bearing materials.

Compliance to all major standards

The food, beverage and pharmaceutical industries have an ever growing number of standards and authorities that aim to prevent harm to consumers. Where some companies may struggle to keep up, due to rigorous testing regimes and stringent standards, Trelleborg can excel.

"A leading player like Trelleborg finds it easier than other companies to meet the costs of developing and testing the special compounds required to fulfill legal and quality management requirements," says Food, Beverage & Pharmaceutical Segment Manager for Europe, Ferdinand Schwabe.

Growing Populations and Growing Concern

The Day of Seven Billion, that is the day the world's population surpassed seven billion individuals, was designated by the United Nations Population Fund (UNFPA) as October 31st, 2011.

"The world population is growing, and more people have access to processed food and medicines, so this market is showing consistent expansion," says Ferdinand.

Increasing health consciousness among consumers has resulted in a desire for processed foods lower in fat, preservatives and sugar, creating additional safety issues. With food designed for microwave cooking, sugar and preservative reduction can lead to potential food safety issues.

For more detailed information on the standards governing the Food, Beverage and Pharmaceutical industry visit:

www. tss.trelleborg.com

Health Consciousness, New Challenges

"Products that contain low amounts of sugar and preservatives are often more susceptible to microorganisms," continues Ferdinand. "As microwaved food is only heated up briefly, there can be a risk that pathogenic microorganisms, if present, are not always reliably killed. This raises hygiene requirements within the industry." These kind of issues mean that demands on hygienic seals are increasing.

"Hygienic design is a big issue within the food and pharmaceutical industries," says Ferdinand. "Seals and sealing materials need to be designed for perfect cleanability. For example, heat exchanger manufacturers want to increase cleaning temperatures from 80°C to 140°C / 176°F to 284°F to make cleaning less time consuming.

"Additionally, media compatibility is becoming more and more important, with manufacturers utilizing alkaline, acidic and chlorine based cleaning fluids or disinfectants containing active oxygen. Our seals must handle these conditions and significant research and design resources are devoted to engineering seals and seal materials to provide solutions for the harshest of environments. "

Facts

CIP & SIP

Automated Cleaning in Place (CIP) and Sterilization in Place (SIP) are currently the best methods for cleaning closed processing systems. They ensure safety and efficiency, prevent toxic contamination of products and minimize recontamination of the process. Their complex formulations of chemicals can rapidly cause severe damage to elastomeric seals, especially in applications with load and pressure. At high temperatures and with steam sterilization, which is now commonly up to 150°C / 302°F, this deterioration is intensified.

Matching the seal material to the system media and the cleaning chemicals can maximize intervals between planned maintenance and production yield. By analyzing detailed specific requirements, Trelleborg Sealing Solutions can propose cost-effective solutions that are compliant to all major standards and are proven to stand up to almost all known cleaning regimes, however stringent.

A full range of material for all standards

To identify materials compliant with food, beverage and pharmaceutical standards use our online tools or consult your local Trelleborg Sealing Solutions marketing company.

Materials

Turcon® MF

Where compliant materials are needed, the Turcon® MF range has been formulated to meet bioprocessing, food, beverage and pharmaceutical production demands. Based on ultra-clean technology, these compounds are manufactured from high-purity Polytetrafluoroethylene (PTFE) grades and special fillers. Their smooth finish, with high gloss, avoids the risk of contamination build-up and reduces particle shedding.

The ultimate resource for engineers specifying seals

Trelleborg Sealing Solutions has been supplying seals to the food, beverage and pharmaceutical industries for over 50 years. Working closely with customers, we have gained a mass of knowledge and industry experience.

Our range of **online tools**, including material chemical compatibility check, can provide you with the best material for your chosen application.

Visit the website to see the **film** of how Trelleborg Sealing Solutions can provide you with the optimal solution for your industry.

Our **Electronic Catalog**, which is available through the registration area on the website, allows you to search for seals that comply to specific industry standards.

www. tss.trelleborg.com

Standards

	FDA	EU	3-A SSI	USP	NSF	ISO	French Ministry of Economy, Industry and Employment	BfR
Standard authority	The Food and Drug Administration (FDA) is a government agency within the U.S. Department of Health and Human Services	The European Parliament and the council of the European Union have adopted a regulation that is valid in all member states of the European Union	3-A Sanitary Standards, Inc. (3-A SSI) is a not-for-profit U.S. organization that formulates sanitary standards and accepted practices for dairy, food, beverage and pharmaceutical equipment	The United States Pharmacopoeia (USP) is an independent, science-based public health organization. The USP is considered one of the most technologically advanced and respected pharmacopoeias in the world.	NSF International is a not-for-profit, nongovernmental organization known worldwide for providing national standards and certification services in the areas of health and safety.	ISO is the International Organization for Standardization. ISO developed standard 10993 for biological evaluation of medical devices.	The Ministry prepares and executes government policy in many areas including consumer affairs and industry.	The German Federal Institute for Risk Assessment (Bundesamt für Risikobewertung, BfR) updates and elaborates recommendations within the framework of the “Federal Food and Feed Code” (LFGB.)
Regulations applicable to seals	The 21 CFR part 177 consists of sections covering requirements for many different polymeric materials, such as section 2600 for rubber materials.	The purpose of Regulation (EC) 1935/2004 is to ensure the effective functioning of the internal market and providing the basis for ensuring a high level of protection of human health.	3-A SSI Standard number 18-03 ‘Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces’. 3-A SSI Standard 20-27, Multiple-Use Plastic Materials Used as Product Contact Surfaces.	USP Chapter <88>, in vivo: It classifies materials into six classes, where class VI requires the most extensive testing. USP Chapter <87>, in vitro: In this cytotoxicity test, extracts from the material go into a cell culture medium and undergo a growth inhibition test with mouse fibroblasts.	NSF/ANSI Standard 51 “Food equipment materials” is a certification of materials used in the construction of commercial food equipment. NSF/ANSI Standard 61 “Drinking water systems components health effects.” requires sealing material formulation to be fully disclosed, toxicology tested and reviewed	ISO 10993-5: Biological evaluation of medical devices. Part 5: In vitro testing for cytotoxicity. The test method is the same as for USP <87> but displays the results differently.	Order of November 9th, 1994: This national law contains positive lists and requires a series of laboratory tests.	Recommendation XV, silicones describes in section III the requirements on silicone elastomers. Recommendation XXI, Commodities based on natural and synthetic rubber, contains formulation recommendations for rubber articles.

Like previous Lamborghini models, the Aventador shares its name with a fighting bull. The legendary Aventador was a trophy-winning bull in the world of Spanish bullfighting.

Fit for super sports

Of all the finely tuned mechanical parts that go into manufacturing a high-end sports car such as the new Lamborghini Aventador, the shock absorbers are the guarantee of a smooth ride.

Shock absorbers manage the physical loads that are transferred from the wheels into the car. In the case of the Lamborghini Aventador super sports car, unveiled at the 2011 Geneva Auto Show, shock absorbers from Öhlins Racing, with Trelleborg seals and skirted pistons, guarantee an extremely precise, razor-sharp driving performance, even at speeds of 350 kilometers/ 220 miles per hour.

Like most successful Swedish companies, Öhlins was founded on a brilliant idea. Apart from the Lamborghini logo, Öhlins is the only other brand visible on the Aventador, a testament to the car's superior handling.

Back in the 1970s, motocross enthusiast Kenth Öhlin realized that better performance could be achieved through improved wheel suspension. Since then, Öhlins shock absorbers have helped win more than 200 world championship trophies in motorsports.

"If you can ride it or drive it, we can make it handle better," says Rade Catovic, Project Manager for the Lamborghini damper at Öhlins Racing.

"The new Lamborghini Aventador super sports car has a pushrod spring and damper shock-absorbing system inspired by Formula 1," he says. "With the help of Trelleborg's seals, it was perfectly tuned to meet the needs of a high-performance road vehicle."

Instead of being located in the wheel mounts, the spring and damper elements are connected inboard to the body or shell structure of the vehicle.

The spring and damper elements, or shock absorbers, are transversely positioned – two under the windshield at the front and two close to the engine in the rear. Relay levers and rockers transmit the forces from the wheel mounts to the spring/damper elements. As a result, handling is more responsive and easier to manage at all speeds.

"The Lamborghini Aventador is the only car in series production in the world that has this shock-absorbing solution," says Catovic.

Another first is the use of the Ferrari-proven system to lift the front axle. Here, a hydraulic lifting system enables the front end of the car to be lifted 40 millimeters/ 1.6 inches at the touch of a button to avoid minor obstacles when entering garages, driving onto ferry gangplanks or maneuvering over speed bumps. This is also a Öhlins system with Trelleborg seals that are used on the Ferrari 458 and the Ferrari FF.

"In the world of suspension, Öhlins is well known for performance," says Catovic.

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The Aventador

The Lamborghini Aventador was first shown at the Geneva Motor Show in March 2011 and has been called a new reference in super sports cars by the motoring press. Lightweight and exquisitely designed with superior handling, the Aventador has a 6.5-liter V12 engine that gives an effect of 700 horsepower and can achieve 0 to 100 kilometers/ 0 to 62 miles per hour in 2.9 seconds. Top speed: 350 kilometers/ 220 miles per hour. Price: around EUR 324,000/ USD 420,000.

"The Lamborghini Aventador is the only car in series production in the world that has this shock-absorbing solution."

Rade Catovic, Öhlins

Two shock absorbers are positioned under the windshield at the front and two close to the engine in the rear.

The Trelleborg factor

Öhlins Racing partnered with Trelleborg to develop the shock absorbers for the new Lamborghini Aventador. Trelleborg supplied all sealing components, including O-Rings, Back-up Rings, skirted pistons and X-rings.

A skirted piston is a continuous polytetrafluoroethylene (PTFE) sleeve, bonded around the shock absorber piston, which acts as a seal and guide.

According to Sales Engineer, Josef Johansson, Trelleborg is the biggest supplier of sealing solutions to Öhlins. "It is exciting for us to work with such a high-performance company as Öhlins," he says.

Says Rade Catovic, Project Manager for the Lamborghini damper at Öhlins Racing: "This was a prestigious project where quality and performance were of the utmost importance. Instead of off-the-shelf products, we worked closely with Agge Tonndorff and Pär Utterström from Trelleborg, sometimes even on weekends, to develop the optimal shock absorber. This type of close cooperation with sub-suppliers, tapping into their knowledge base, is the way we want to work in the future."

Facts

Öhlins in brief

- 245 employees
- Kenth Öhlin sold 50 percent of the company to Yamaha in 1987, but he repurchased shares in 2007 and now owns 95 percent.
- Headquarters: Stockholm
- Subsidiary in the U.S. – Hendersonville, North Carolina (23 employees)
- Subsidiary in Germany – Nürburgring (five employees), considered one of the toughest automotive test tracks in the world.
- 130,000 shock absorbers produced per year
- 97 percent of all sales are for export
- Annual revenue around EUR 53 million (almost 70 million USD)
- Annual growth 15-20 percent in the past 10 years
- Focus on R&D, OEM and racing of advanced suspension technology for motorcycles, cars, snowmobiles and all terrain vehicles (ATVs). Besides Lamborghini, Öhlins' client portfolio includes some of the biggest names in the automotive industry – Ferrari, Pagani, Audi, Mercedes, Volvo, Ford and Volkswagen.

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The automotive industry is continuously demanding more economical solutions from its suppliers. Some respond by just cutting costs and prices, but Trelleborg's approach is very different, instead focusing on innovative solutions.

Uniquely Layered

The Rubore® technology is unique. It offers an advanced technique to create a two-to-five layer, rubber-metal sandwich which has already become world leading in brake shim applications for the automotive industry. The potential benefits of the process have led Trelleborg to successfully expand Rubore® applications to the world of sealing in general.

Every Rubore® seal will be customized to the individual project in order to achieve the optimum solution for the application. By combining our unique composite material with specialized designs and engineering expertise, Trelleborg is able to create a number of advantages for the customer.

A Host of Advantages

"The unique vulcanization process used for Rubore® seals leads to seal designs which fill even the smallest of holes on the metal substrate or counter surface, compensating for any surface roughness," says Jan-Michael Zumbach, Project Manager of Composite Materials, Trelleborg Sealing Solutions Automotive.

This eliminates the need for surface finishing and after-treatments that can drive costs up and add extra stages to production for customers. The lean manufacturing process leads to overall cost benefits and greatly reduces weight of the product, while still maintaining dimensional stability allowing for the creation of complex and intricate geometries in the seal profile. "This permits new designs for groove areas, saving weight on steel and cast parts in particular," continues Jan.

The stiffness of Rubore® products also contributes to a reduction of handling costs. "They are easier to assemble than their alternatives, saving time and reducing logistics requirements. Unlike other products available on the market for similar applications, automated sealing can be achieved, including full robotic assembly, a process which is nearly impossible and costly to use with normal elastomeric seals," says Jan, "This also adds the benefit of removing human error that can potentially create gaps through misalignment, resulting in unwanted leakage."

In short...

- Rubore® is a unique technology
- A two-to-five layer, rubber-metal sandwich provides cost benefits, weight reduction and allows more complex and intricate geometries
- Already world leading in brake shim applications and expanding to the world of sealing in general

Meet our heroes online!

Visit the Rubore® website to view films and learn more about this unique technology. Suggest applications this technology could be used for to have a chance at winning an iPad!

www. rubore-seals.com

Rubore®: rubber-to-metal bonded seal. The thickness of the rubber layer is adjustable to the application

Uniquely Manufactured

The Rubore® process involves two steps. First a resin coating is applied to metal carriers and the rubber is calendered. This is then followed by vulcanization of rubber to the metal, resulting in excellent bonding. The coating process and combination of raw materials with primers/bonding agents is one of the core competencies of Trelleborg's manufacturing facility in Kalmar, Sweden, where the products are manufactured. The facility is capable of producing metal coils 1.25 m / 49 inches in width and 800 m / 2,600 feet in length, from which various shapes can be stamped in-house. In addition, the thickness of the rubber layer can be adjusted to suit the application. Die-cutting of concave and convex edges, deep-drawing of vulcanized parts and patented grinding and stamping technologies can be used to optimize product functions resulting in a product that stands apart from its competition.

A Unique Approach to ECU sealing

By 2015, it is expected that controls on cars will have shifted to 40% electronic and 60% mechanical. This makes it all the more critical to achieve a secure seal on an electronic control unit (ECU), especially as a failure could result in a serious safety issue. The room available within an engine compartment or vehicle interior is limited, meaning that complex designs which fit space requirements are essential. In a harsh environment, like the engine compartment, the ECU cover is constructed from metal and sealing would have previously been done using a molded gasket, manually inserted into the groove.

Trelleborg Sealing Solutions realized that the sealing technology to achieve the optimum solution lay within their innovative Rubore® technology. A Rubore® Cover Seal integrates the seal and ECU cover in a single integrated unit meaning costly manual installation is no longer needed. This results in a perfect solution at a reduced cost. Moreover, integrating the ECU cover and the seal in the Rubore® Cover Seal reduces the number of parts, minimizing logistics, assembly and administration costs.

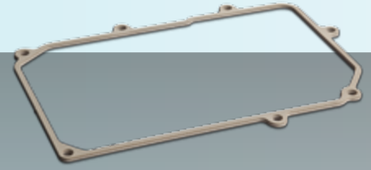
Rubore® Cover Seal

Rubore® Cover Seal

Deep drawn seal with integrated seal

Applications
- Electronic components
- Sensor housing
- Protective covers

Benefits
- Easy assembly/handling
- Secure solution
- Low mounting forces
- As the seal is integrated into the cover, it will not be lost
- Benefits of sealing lip:
  - Accurate positioning of the sealing lip
  - Reduction of vibrations



Rubore® Frame Seal

Rubore® Frame Seal

Thick gasket with narrow geometry for good compression – Indirect force connection

Applications
- Electronic components
- Sensor housings
- Filters

Benefits
- Weight reduction
- Efficient assembly (stiffness allows automatic handling)
- Lower cost counter-surfaces
- No groove
- High roughness compensation

Rubore® Flat Seal

Rubore® Flat Seal

Stamped out flat gaskets with complex geometry – Direct force connection

Applications
- Perfect for Flange Connections
- Intermediate plates (automatic transmissions)
- Electric motors
- Engine side flanges
- Pumps

Benefits
- Weight reduction
- Seals pinholes on the contact surface (flexible rubber fills even the smallest of holes)
- Flexible rubber layer (no micro leakage)
- Thickness of material perfectly adjustable:
  - Accurate positioning of the sealing lip
  - Reduction of vibrations

Rubore® Slide Ring

Rubore® Slide Ring

Metal reinforced guiding rings for reduced friction – dynamic applications

Applications
- Actuator in hydraulics and pneumatics
- Shock absorbers
- Clutches
- Suspension in general

Benefits
- Long service life
- Price advantage due to reduced amount of PTFE
- The rubber layer gives higher friction and damping, no vibration in the groove
- Layer Functions:
  - PTFE - smooth motion
  - Metal - stable position
  - Rubber - optimum damping with high friction
  - Overall - secured function

Rubore® Cap Seal

Rubore® Cap Seal

Deep drawn, circular cover for hydraulic applications

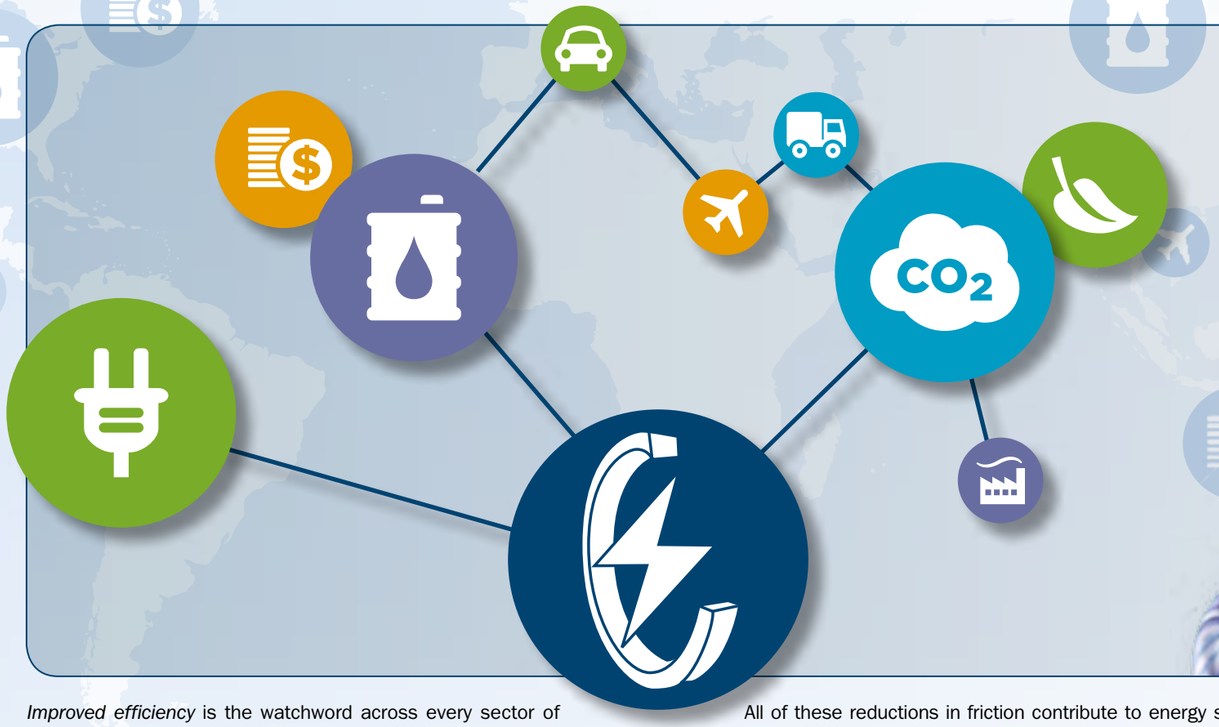
Applications
- Static sealing of circular holes
- Gearbox
- Engine block

Benefits
- No glue or adhesive
- Long service life
- Good chemical resistance
- Absolutely reliable production process
- Consistent high quality
- Price advantage due to optimized production process

The Rubore® technology was developed in the Trelleborg manufacturing facility located in Kalmar, Sweden. Over 50% of the world's passenger car brakes utilize the technology in their shims. Now this innovative process is being developed to provide benefits in other applications.

Saving energy and cutting emissions by reducing friction

Saving energy can help protect the environment and lower costs.



Mark Simms, Editor,
Industrial Technology
www.industrialtechnology.co.uk

Regardless of anyone's particular stance on climate change, there is little doubt that the measures being taken by governments around the world as a response to climate change are continuing to have a profound impact on the industrial landscape.

Industrial businesses across all sectors are being asked to bear the brunt of these measures, with tax levies based on electricity usage. The onus is very much on industry to increase its efficiency.

Then there is the high cost of oil. How many of the international crises of the last two decades have either been about oil or have had a direct impact on the price of oil?

A Bad Combination: Fuel Costs & Friction

The U.K. may no longer have any reliance to speak of on oil as a means of generating electricity, although that is by no means true of other parts of the world. But the price of oil directly impacts the cost of fuel, and prices are moving inexorably upwards.

It is no surprise, then, to see all the automotive manufacturers working on power plants and technologies that will deliver more miles per gallon. And let's not forget the legislative requirements on those automotive manufacturers to produce vehicles with significantly reduced CO_2 emissions.

All of this has implications for seal technology. Friction is the enemy of all moving components, be it linear or rotating motion. Whether we are talking about vehicles or aircraft, machinery or processing plant, electromechanical or fluid power technologies, reducing frictional losses can make a huge contribution to increasing overall efficiency.

Seal Technology Impacts Efficiencies

Of course there are many aspects of the chain in any given motion system that impact on friction, but the seal is certainly a contributor. The days of cheap energy, unrestrained consumption and unchecked emissions are forever behind us, and every measure we can take to reduce friction is a vital measure.

Improved efficiency is the watchword across every sector of industry. From the mechanical seals used in the process and manufacturing industries to the radial shaft seals critical on rotating shafts in areas such as machinery and automotive technologies, energy efficiency has become a prerequisite of seal specification.

The seal industry is often spoken about as being a mature sector, and yet seal companies are constantly developing new materials and improved configurations that will dramatically reduce friction.

Putting Materials & Technology to the Test

Advances in the science of materials, combined with the latest in computer-aided design and simulation technologies, are being applied to seal design. The results are materials that deliver improved performance while achieving exacting requirements and low friction.

These new high performance seals deliver both low friction continuous motion and low stick-slip in start/stop operations. All of these reductions in friction contribute to energy savings that quickly accumulate.

Such advances don't just benefit new machines, processes and products. Retrofitted to older machines – perhaps products that were developed long before any significant advances in materials science – the latest seals can inject a new lease of life, improve efficiency and so reduce energy requirements and/or CO_2 emissions.

Stringent Controls Drive Change

For the future there is little doubt that emission controls will get ever more stringent, and the likelihood is that energy and fuel prices will continue to rise. We can be assured, though, that seal technology will continue to evolve and develop to keep pace with evolving requirements.

But I wonder what we can look forward to alongside improvements in materials and configurations to further reduce friction. Condition monitoring is one area where seal manufacturers are able to add value to their products, promoting preventative maintenance as opposed to reactive maintenance. How far, though, could we take condition monitoring, and what might the implication be for further reducing friction?

Just suppose we could close the loop in the condition monitoring process. Is there the possibility for self-adjusting seals, using active control strategies that would adjust seal clearance dynamically to maintain optimum low friction performance?

The Innovation Continues

Perhaps right now the cost of such a system would be prohibitive, or maybe with today's available technologies the seal itself would be too bulky to be practical. But you can bet that if such a system is in any way possible or practical, sealing manufacturers will be working on it. For an industry that is regarded in many quarters as 'mature', it is surely one of the most innovative, forward thinking and dynamic around.

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High impact sport gets a smooth ride

High-performance bike manufacturers are always looking for new technologies to offer greater comfort to their riders.

Rear shock absorbers are often used in conjunction with front suspension on high technology bikes to improve the user's ride. Shock absorbers usually consist of two parts, a spring and a damper. The spring can be made with a steel or titanium coil, an elastomer, or in more advanced models, is activated with compressed air.

The air spring has the distinct advantage of being lighter in weight while giving optimized performance, tailored to the rider's requirements.

Requirements for Sealing of the Rear Shock Absorber
- Withstand high impact on rough terrain
- Effective long-term operation

Sealing within the rear shock absorber has an overall goal of enabling rider comfort even in the most demanding conditions.

Check out the new brochure Sealing Solutions for Advanced Bicycle Technology at

www.tss.trelleborg.com

Case Story

HB (Manitou)

HB (Manitou) is a world-renowned company involved in the design and manufacture of hydraulic disc brakes and suspension for bicycles. Established over 20 years ago, the company has developed many high performance shock-damping systems . Ed Kwaterski, Project Manager at HB says: "The bicycle suspension is not just a mechanical component, but also a work of art. Therefore, in addition to our own innovation and R&D efforts, we also need help from other superior suppliers; Trelleborg is one of them."

Air Spring

Seals within the air spring give maximum service life and effective leakage control.

Trelleborg products: Quad-Ring®, Turcon® T-seal, Turcon® AQ-Seal®, Slydring®

Damping System

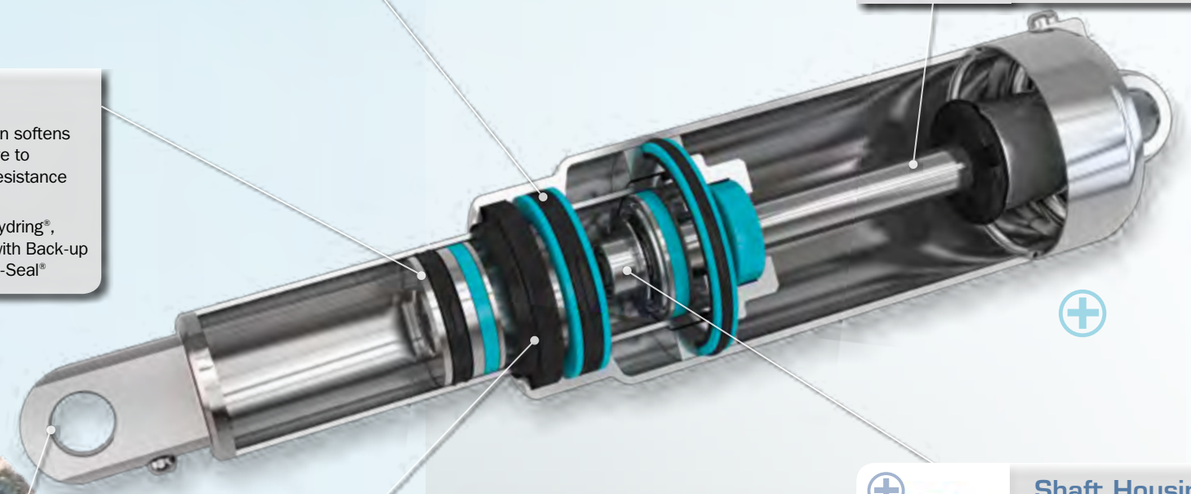
A bumper and static seal with high compressive strength are key to the operation of the damping system and rider comfort.

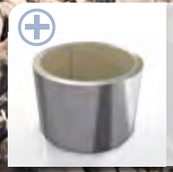
Trelleborg products: Custom-molded bumper in NBR or HNBR, O-Ring

Floating Piston

Part of the suspension, the piston softens the ride for the cyclist. Seals have to demonstrate exceptional wear resistance and durability.

Trelleborg products: Turcon® Slydring®, Step Cut Slydring®, Quad-Ring® with Back-up Ring, Turcon® T-Seal, Turcon® AQ-Seal®

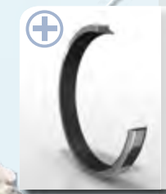




Eyelet

A guide ring facilitates the movement of the eyelet that links the bike to the shock absorber.

Trelleborg products: DU Bush



Rear Shock Body

Minimized leakage of the damping system is ensured with a configuration of seals that retain oil or air in the shaft.

Trelleborg products: Scraper DA22, Scraper WSA

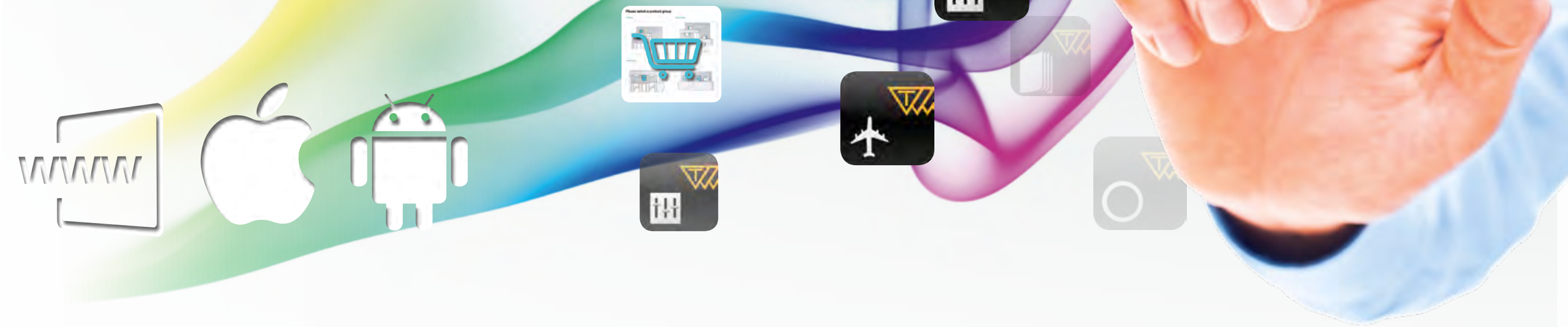
Shaft Housing

Within the shaft housing, seals retain oil or air within the damping system. The seals must demonstrate low friction and exceptional wear resistance.

Trelleborg products: Zurcon® U-Cup, Zurcon® L-Cup, Slydring®, Turcon® T-Seal, Turcon® AQ Seal®, Quad-Ring®

At your fingertips

Trelleborg Sealing Solutions has devoted a considerable amount of resources to developing e-tools and apps over the last few years. *In the groove* took the opportunity to talk to Andy Longdon, Technical Manager at the Trelleborg Sealing Solutions marketing office in Solihull, England, about how he sees them being used in practice.



ITG: Has the way engineers access technical information changed?

Andy: We engineers love printed material that we can scribble notes in, and we probably always will. We have our book shelves full of engineering and technical manuals, but that doesn't mean that we don't use the internet.

We know our customers are accessing our technical information from the internet all the time. We see them downloading our catalogs and using our e-tools. And it's not just the younger generation or those in what may be considered high-tech sectors, it's engineers of all ages and from all industries.

ITG: Do you use the e-tools?

Andy: Yes, all the time. We use the O-Ring Calculator internally as our tool for specifying O-Rings so when a customer calls with a query we're working with exactly the same tool as they are.

Some companies create tools and apps that are more like games than actual usable and valuable tools. The Trelleborg Sealing Solutions tools and apps have been developed by engineers for engineers, so they're designed to assist the seal specification processes and I find them as helpful in my work as our customers do. Having apps such as Converter and ISO Fits available 24/7 is particularly useful.

ITG: Do all of our customers know about our e-tools and apps?

Andy: We're always promoting the tools and apps. If we're at an exhibition we'll demonstrate the O-Ring Calculator and show the film on the Sealing Solutions Configurator and the apps. When our sales or application engineers meet with customers they take them through all the resources they have online. It's an education process that yields real benefits.

ITG: Does the U.K. have many project discussions via the Sealing Solutions Configurator?

Andy: It doesn't seem to appeal to everyone, but it's a great way for customers to start looking at specifying the right seal for their application. I'm not sure there is any such thing as a standard application. However, if the customer has used the Configurator as an initial guide it has at least prompted them to think about all of the parameters we need to consider to ensure the optimum solution is specified when they approach us to either confirm the choice or develop a custom solution.

ITG: What feedback have you had from customers on the tools and apps?

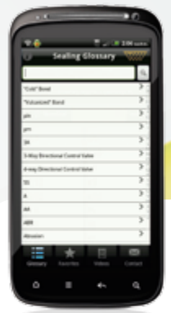
Andy: All the feedback that we have is good. For example, our O-Ring Calculator is generally regarded as the best in the business. There are no real negatives coming back from our customers, the only criticism has been positive. For instance, once our apps were launched for the iPhone, we had many requests for our apps for Android.

ITG: Are there are any new tools and apps in the works?

Andy: As a global technical team we're continuously suggesting and developing new e-tools and apps. There are several in progress and due for launch later this year and next. Engineers also have the opportunity to submit ideas for new e-tools and apps through the Trelleborg Sealing Solutions Innovation Award.

Apps, e-tools & services

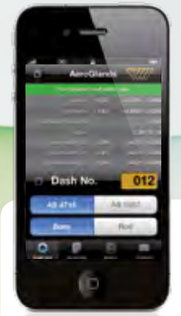
Trelleborg Sealing Solutions provides a broad range of online tools and services, as well as a number of apps to make the engineer's working life easier.



NEW

Technical Glossary

Provides a detailed overview of engineering and sealing based terms and definitions – app in development to complement web version



NEW

Aerospace Groove Selector

Covers the most important SAE aerospace groove standards for hydraulic systems, AS4716 Rev B and AS5857 Rev A.

O-Ring Selector

Calculates O-Ring dimension tolerances and recommends Trelleborg Sealing Solutions part numbers; Chemical Compatibility Check included

ISO Fits & Tolerances

After selecting nominal diameter and tolerance classes, the app provides the complete ISO fits definitions

Unit and Hardness Converter

Quick and easy unit conversions to speed up your workflow

Find our e-tools

Due to many requests, we are constantly developing new tools and services, and several of our tools are also in progress of being ported to different platforms. Check back often to see our latest developments!

In GooglePlay and in the App Store, type in "Trelleborg" to see all available apps.

For access to web tools please visit **www.tss.trelleborg.com**

Tools & Services website platform

- **Seal configurator**
  Provides the most suitable solutions for your application
- **Electronic catalog**
  Search for seals by item number, type of seal or by operating conditions.
- **O-Ring calculator**
  Recommends O-Ring sizes and corresponding part numbers
- **CAD service**
  Easy access to 2D and 3D technical drawings
- **Material search**
  Quickly find suitable materials for your application
- **Chemical compatibility**
  Find materials compatible with media used in your application, also included in O-Ring selector app
- **Online catalogs and brochures**
  Access to the full range of literature from Trelleborg Sealing Solutions

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Widely viewed as one of the safest and most efficient methods of travel, railways around the world represent a large global industry. Not only for trains themselves but also for all the infrastructure that needs to be maintained and expanded.

On the right track

The oldest known railway in the world dates back to the 6th century B.C at the Isthmus of Corinth in Greece. It allowed ships or cargo to be dragged across land on tracks by horses or slaves to avoid the sea route around the Peloponnese.

After the introduction of steam engines, mainline railways began to be developed, a key component of the industrial revolution, which allowed fewer lost goods and lowered shipping costs. Without doubt, the railways changed the face of European industrial progression.

Today, integrated rail networks cover the whole of Europe and though passenger rail use in the U.S. is relatively low, freight rail is responsible for transport of a large proportion of the goods used in the country. Rail freight services in nearly all countries carry bulk raw materials such as coal, ore or sand and semi-processed industrial goods like chemicals, steel and fertilizer.

Though dormant over recent years, passenger rail travel is now seeing a revival across Europe as an indirect result of airlines slashing flights and cutting spending due to rising fuel prices. Estimated figures for rail travel in 2010 were around 25 million passengers using high-speed rail links and growth is expected to continue over the next 10 years.

Developing countries are seeing high investment in rail infrastructure. In 2005, 63% of the world's rail freight was carried in developing regions and over three quarters of this carried in just three countries; China, India and the Russian Federation. This proportion has been steadily growing over the last 20 years.

Millions of people use railway systems for travel in China and India everyday and with its 63,000 km/39,000 miles of track, India probably has the most extensive rail network in the world.

From the distant past to the future, rail networks are an important driver of economic growth, fueling large-scale cultural change such as the industrial revolution and the current surge of growth in India and Asia.

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High-speed link

Trelleborg Sealing Solutions supplies a wide variety of products to make rail journeys more comfortable, efficient and safer.

- high speed train
- locomotive
- tramway

Tank for chemical and combustible fluids

With innovative Fleximold® technology, we are able to produce many types of large dimension O-Rings for tanks. HiMod® Flatseals in specialized materials are suitable for flat gasket applications.

Power generation and transmission

Trelleborg Sealing Solutions provides sealing solutions for all locomotive power train and transmission components. These seals provide easy handling and installation, reduced wear, noise and vibration thus providing longer service life, increased performance and cost efficiency.

Products: Gaskets, Bonded seals, V-Ring®, Radial Oil Seal, Turcon® Varilip® PDR, Cassette Seal

Axle Bearing

Designed to provide superior radial stiffness, low torque and less heat generation during operation, these seals can withstand high side loading and harsh conditions. A cost-effective solution adding stability to the whole bearing system.

Products: Radial Oil Seal, Diaphragms

Passenger Bogies and Wagons

Windows and door sealing

Trelleborg offers a variety of proprietary materials that meet specific industry standards on toxic emissions, fire and smoke resistance. Extruded profiles of these materials ensure effective high-pressure sealing in freight wagons and passenger compartments, ensuring greater safety for travellers.

Products: Extruded Rubber profiles, door gaskets inflatable seals

Door actuators

Seals are located in the door's pneumatic valves helping actuators provide longer service life, increased cost effectiveness and reduced maintenance.

Products: Hydraulic Seals, Pneumatic Seals

Truck Body

Trelleborg Sealing Solutions has a dedicated range of Orkot® materials and products for liners. These composite materials and products offer low friction, reduced wear, resistance to corrosion and high strength properties to withstand the severe loads and increase performance.

Products: Orkot® Wear Pads and plates, Wear Rings

Braking Systems

Trelleborg Sealing Solutions offers superior products for safety-critical braking systems. The seals in the brake cylinders make sure the piston movements are smooth, with low friction, reducing wear and extending service life.

Products: O-Rings, Back-Up Rings, Diaphragms, Bellows

Suspension Actuator and Stabilizer

These seals ensure a smoother ride for freight cars and passengers. Situated in the hydraulic dampers, stabilizers and the accumulator assembly, they offer robust sealing, longer service life and low maintenance.

Products: Hydraulic Seals, Turcon® and Zurcon® materials

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Life science is a key area of focus for Trelleborg Sealing Solutions and investments in this sector are consolidating our world-class position in silicone moldings for this fast growing industry.

Healthy moldings

With expertise in silicone applications for the medical device, biotech, pharmaceutical, and food and beverage industries, Trelleborg Sealing Solutions has been at the forefront of silicone manufacturing and design from the birth of this specialized elastomer.

Following the acquisition of operations from Silcotech during 2011, the company now commands a globally coordinated market leading position with development, expertise and manufacturing of silicone moldings in Europe, the U.S. and China and is recognized as a world market leader in this technology.

Broadened capabilities and global footprint

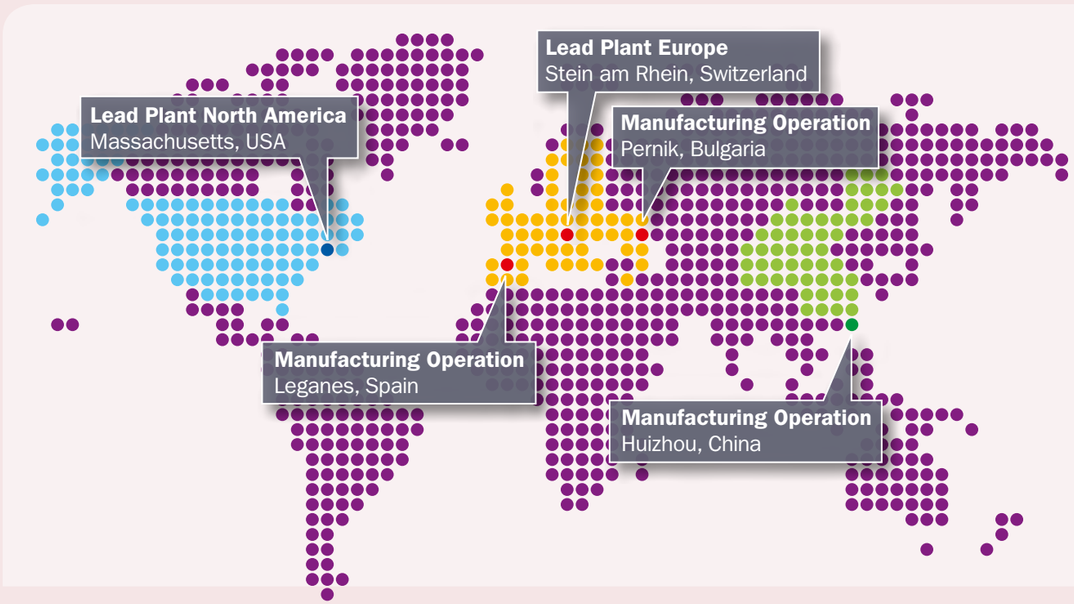
Originally, manufacturing was focused in the U.S., with a silicone center of excellence in Hudson, Massachusetts. In April 2011, Trelleborg acquired operations within Silcotech Group. Not only did this broaden our global footprint into Europe but also expanded the company's expertise in cleanroom manufacturing of silicone components and in the production of silicone two-component products for the pharmaceutical and medical technology industries.

"Silcotech's technology gives Trelleborg capabilities in automated processes to produce precision seals in high volumes and components with very tight tolerances in liquid silicone," says Matthias Jakob, General Manager of Trelleborg Sealing Solutions in Stein am Rhein, Switzerland. An expansion of the Swiss facility was announced in early 2012. "Our latest investment brings us closer to increasing our global footprint in liquid silicone parts for medical and pharmaceutical applications."

In short...

- The acquisition of operations within Silcotech Group extends Trelleborg's global reach and expertise in life sciences
- Capability to produce large volumes of liquid silicone seals and components to the highest level of precision in a fully automated process.
- Further investment is taking place
- US Pharmacopeia Class VI, NSF 51 and 61, A3 and FDA approval and standards, as well as various other country- and customer-specific standards.
- Manufacturing facilities certified to multiple standards including FDA registration, ISO 13485, ISO 9001, and ISO 14001. Production in Class 100,000 and Class 10,000 Cleanrooms to ISO Standards 7 and 8.

A globally coordinated market leading position with development, expertise and manufacturing of silicone moldings in Europe, the U.S. and China



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Peristaltic pump tubing produced by Trelleborg Sealing Solutions

Complex & precise liquid silicone injection molded parts

Precision seals for a unique, new inhaler for acute respiratory treatment

Blood separator

Respiratory mask made of silicone is part of our portfolio

Silicone advanced molding – a global technology leader

Trelleborg Sealing Solutions has few, if any, competitors who can match our capabilities and expertise in silicone development and manufacturing.

In the U.S., Trelleborg Sealing Solutions' center of excellence for silicone is based in Massachusetts. The operation entails five major product lines: tubing and profiles, silicone sheeting, LSR custom molding, reinforced hose and related value-added assemblies. Its products are found in blood separators, blood analyzers and peristaltic pumps. Other applications include catheters, filtration gaskets and dialysis machines.

Wide product offering

The current operation in Massachusetts is FDA registered and ISO 9001 / ISO 14001 accredited. Class 100,000 and Class 10,000 Cleanrooms to ISO Standards 7 and 8 and overall site accreditation to ISO 13485 will be added in upcoming months as part of a significant site expansion and investment to support the increasing demand for LSR custom parts from life science applications.

Materials compliant and certified to such standards as US Pharmacopeia Class VI, ISO 10993, NSF 51 and 61 and other international potable water standards such as WRAS, 3A-Dairy and FDA approval are commonly available.

While hoses and tubing tend to be a staple for many silicone customers, Trelleborg Sealing Solutions also has advanced capabilities in custom molding using a liquid injection molding (LIM) process. These capabilities increase the potential customization of products, providing essentially limitless options in shape and complexity of products.

Expansion and expertise

In April 2011, Trelleborg acquired operations from within Silcotech Group including a manufacturing operation in Switzerland and joint venture operations in Bulgaria, Spain and China. The acquisition encompassed the entire operation in Switzerland, including the manufacturing facility as well as the joint ventures, and brought in expertise in high-volume automated liquid silicone injection.

Trelleborg Sealing Solutions announced a further investment of 8 million EUR (9.9 million USD) in silicone manufacturing for life sciences in early 2012 to be made at the Stein am Rhein facility. The size of the site's cleanrooms will be tripled and overall manufacturing capacity will be increased by 30 percent.

The Swiss operation is Trelleborg Sealing Solutions center of excellence for LSR processing and entails Class 100,000 and Class 10,000 Cleanrooms for fully automated manufacturing of custom molded liquid silicone parts and two-component products to the most stringent cleanliness requirements of life science applications. The site is certified to the Standards of ISO 9001, ISO 13485, and TS-16949.

Find out more about our life sciences capabilities

www. youtube.com/trelleborgseals

Silicone innovations

Recently a medical device manufacturer received a grant from the National Institute of Health in the U.S. to design and manufacture a minimally invasive product to remove blood clots in the human brain.

The product design called for a silicone catheter with multiple embedded ultrasonic transducers. The silicone catheter is placed into the blockage, and clot-dissolving drugs, combined with ultrasonics, are introduced to remove the clot.

The company needed a manufacturer with expertise in liquid injection molding, because the catheter requires such precise molding, assembly and overmolding. That customer chose Trelleborg Sealing Solutions and is optimistic of introducing up to 150,000 units a year after market approval.

Life-preserving applications

This is just one example of the numerous applications for Trelleborg Sealing Solutions specialized liquid silicone moldings. Other products include membranes, septa, masks, O-Rings and many custom and complex parts that allow us to take our expertise in tool design, process and automation development to ever increasing levels. To demonstrate our commitment to the life science sector, Trelleborg Sealing Solutions developed a proprietary design of a micro injector due to increased demand for micro silicone parts. This allows the injection of the smallest of shot weights at unmatched levels of precision and repeatability.

Material

Silicone

Silicone is a premier material within elastomers with unique and advanced attributes. Specific to medical applications, its matchless bio-inertness makes it the most suitable elastomer when considering bacteria growth and alleviating contamination concerns. It is, perhaps, the most widely tested and proven material related to human compatibility. Additionally, silicone's mechanical properties prove to be an excellent fit in dynamic applications where accuracy, consistency and longevity are important determining performance factors.

Market

Why healthcare?

One field that Trelleborg Sealing Solutions has chosen to devote time and research is life science. Not only is it a growing market, but it is also a way in which Trelleborg Sealing Solutions can have a great impact on lives. "Life science involves people's livelihood. Our products have the potential to improve someone's well-being. As such, it is arguably the most rewarding market in which to participate," says General Manager of Trelleborg Sealing Solutions North American Operation, Stephen Gilbert. "Life science is an important and growing market where our innovation, materials and manufacturing expertise can provide real value to customers."

New *in the groove* iPad app!

In response to popular demand, you can now download the new app to get interactive editions of *in the groove* for your iPad. Featuring all the same seals and services related articles from Trelleborg Sealing Solutions as the print version, but giving added usability and easier navigation. The interactive version allows you to see films, read articles and visit the referenced websites, all at the touch of a button.

Includes book-shelf where you can find all available *in the groove* magazines for iPad with push notification when a new edition is available

Easier to navigate! Navigation bar, linked contents, direct link buttons and bookmark function aid your reading experience

Brilliant picture quality with hover over support for enlarged versions

Download product brochures and catalogs at the click of a button!

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Share the article via email, Twitter or Facebook

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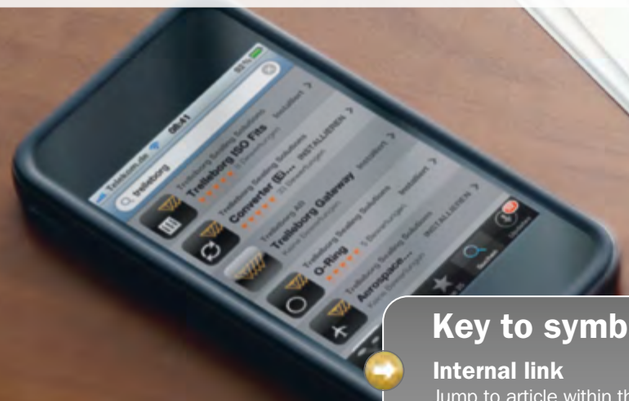
Find articles that include keywords you are looking for

Bookmarks
Create bookmarks of the articles you like



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We're always trying to please and entertain the readers of *in the groove*. To improve what we do, we asked you!

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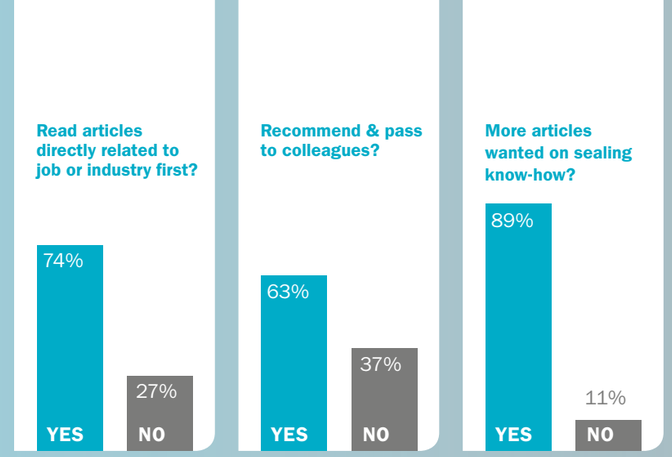

We publish *in the groove* to provide illustrative and informative insights into the sealing sector, including its unique industrial applications and business benefits.

Following numerous published editions of the magazine – which is issued twice per year in print form, as a downloadable pdf and now also as an app for the iPad – we wanted to hear your views.

What did you want to see more of? How would you prefer to read it? Is it relevant to your job function or industry? These were just some of the questions we posed to better understand your reading tastes and help steer the publication in the direction you want it.

To gauge your opinions we sent out an online survey to our readers. Here's a summary of our findings so far:

Our survey said…

A common theme from your feedback was that many of you would like the magazine to be published more regularly, with many readers suggesting we print it quarterly. Over half of you said you'd prefer to receive it electronically via email, which is something we hope to address in future editions of *in the groove*. Watch this space!

Another area of interest we wanted to explore was your reading habits; did you read it all from cover to cover, or were you more selective in your choice of articles? For the most part, it appears you are a discerning audience and start by reading items of direct relevance to your job function or industry.

While many don't read the entire magazine, more than 40% do read most of the articles. Pleasingly, almost two thirds of you said you would recommend or pass along i*n the groove* to your colleagues, which is a great endorsement to receive.

A key purpose of the survey was also to gauge what types of articles you like to read. There was a general consensus among 80% of readers that you wanted to see more in-depth feature articles, case studies, general sealing know-how and practical tips.

Content wise, it's clear that there is a thirst for more information about manufacturing and research & development, plus applications to specific industries such as fluid power, alternative or renewable energies and the automotive sector.

We've taken all of this onboard and will address it in future editions of *in the groove*.

Finally, for a global trade publication aimed at engineers using sealing technology, we are pleased that more than three quarters of respondents felt the articles contained the right level of technical detail and were of the right length. However, we make note of several comments asking for more graphics and illustrations.

Your opinion counts

Thank you to everyone who participated in the survey. We are encouraged by your overwhelmingly constructive feedback, including how *in the groove*, "seems to get better with each issue."

Your responses shape how we construct future editions, so please keep the feedback coming and look out for some exciting new developments, such as the *in the groove* iPad app we've just launched. **For more details go to page 40**.

And the winners are...

We are pleased to announce the winners of our reader survey competition, which are as follows:

T. Weichmann, Moog

Xiangdong Kang, Bosch Rexroth

Erik Gooijer, Bluewater

Congratulations and we hope you enjoy using your new Apple products!

TRELLEBORG
SEALING SOLUTIONS

SOLUTIONS FOR TOMORROW'S ENGINEERING

SEAL MATCHING AT YOUR FINGERTIPS

Years of experience allows Trelleborg Sealing Solutions to offer the Sealing Solutions Configurator, making future applications easier to specify. Innovation in online services means that engineers have access to proven seal configurations at the touch of a mouse or fingertip.

Find more information at www.tss.trelleborg.com or check out www.seals-innovation.com