

in the **groove**

All Industries

The world of seals and service

Aerospace

Next stop, the moon

Sealing on Indian capsule in space



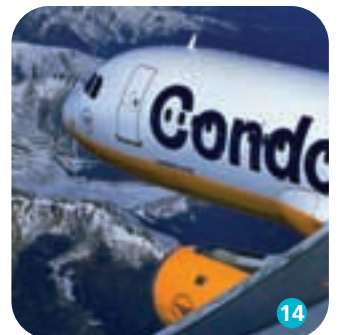
Products

Rotating under pressure

Innovative Zurcon® Roto Glyd Ring® S

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Seals on the road

Our new automotive brochure is now available online or to order. It deals with sealing solutions specific to this market sector.

The brochure covers:

- Our experience in the automotive sector
- Service provided from concept to delivery
- Technologies that match customer needs
- Custom molded designs
- Advanced sealing products and materials
- Unique solutions specific to applications

O-Ring calculator updated

Our online O-Ring calculator originally launched in 2005 has now been updated.

Enhancements in the latest version of the O-Ring calculator include:

- Design recommendations for a broader range of materials including perfluoroelastomers
- Warning messages when there are input errors or deviations from design recommendations
- Operating temperatures for elastomer groups take into account cross section changes
- Linear thermal expansion coefficients are included as preset values which can be overwritten
- Design recommendations are available at the click of an i-button

The O-Ring Calculator is available free of charge for online use on this website through our registration area. Why not check it out online ...

Go to:

www.tss.trelleborg.com



The O-Ring calculator gives certainty of design and substantial timesaving

The Trelleborg Sealing Solutions O-Ring calculator is industry-leading. With its unique functions, it is wholly intuitive and remarkably easy to use. Functions of the calculator include a sizing capability, recommendations on design parameters and complete measurements. Results and comments may be printed, saved online or as a PDF. Incorporating a great deal of sealing expertise, the calculator even considers the complexities of compression, seal expansion and groove fill, while enabling the user to add notes to the results. The benefits of having this easy to use calculator are considerable, giving certainty of design and substantial timesaving.





Under cover

Wipers are fitted to giant umbrellas in Medina

It's every Muslim's ambition, once in a lifetime, to visit the holy cities of Islam. At Hajj over 2 million people make the pilgrimage every year. With temperatures at Medina reaching 45°C/ 113°F and above, giant umbrellas are used to protect pilgrims from the ill effects of sun and heat.

These high technology sunshades are operated hydraulically, and German company Montanhydraulik has supplied the hydraulic cylinders for these, which also form part of the tall umbrella poles.

Both extreme temperatures and sand storms put the motors to the test. To ensure that media is excluded from the hydraulic mechanisms, DA27 wipers in NBR are fitted. These withstand the heat and are capable of bridging a one-millimeter/ 0.04 inch gap in case of movement of the umbrella's pole.



Facts: Medina and the giant umbrellas

Medina [Al Madinah, Yathrib] is the second most important holy city of Islam, the refuge of Mohammed after his flight from Mecca. It is located in a well-watered oasis 180 km/ 110 miles east of the Red Sea. The chief building there is the large mosque, which contains the tombs of Mohammed, his daughter Fatima and the Caliph Omar. When making the pilgrimage to the holy city of Mecca, usually a visit to Medina is part of the trip.

One of the splendors of the newly expanded Prophet's Mosque is the technology used for climatic control in its large open courtyards that are integral to the design of the mosque. This involves an innovative system of sliding domes and umbrellas that are deployed during the hot hours of the day to contain the circulating chilled air and retracted during the cool hours to release the heat.

Each of the 12 mechanized retractable umbrellas, six in each of the courtyards, is 17 by 18 meters/ 56 by 59 feet across and stands 17 meters/ 56 feet high. The armatures extend to carry covers, which together give shade to almost 300 square meters/ 359 square yards.

Improved capability



with new low-temperature machine

Trelleborg Sealing Solutions Americas R&D Material Test Lab offers customers new and improved results

As the sealing industry continues to push the envelope of elastomer performance to unprecedented levels, the ability for R&D to perform low temperature properties testing has become increasingly important.

The Material Test Lab of Trelleborg Sealing Solutions Americas R&D has commissioned an automated Temperature Retraction and Low Temperature Brittleness machine manufactured by the Italian firm Gibitre. With it we can offer customers new and improved results for Temperature Retraction.

New features of temperature retraction testing and results

- Graph of the complete curve for retraction versus temperature
- Time results for TR-10, 30, 50 and 70
- Various original gauge lengths possible
- Various original elongation levels can be achieved

Industry standard test methods

- Temperature retraction: ASTM D1329, ISO 2921, UNI 7897
- Low temperature brittleness: ASTM D2137, ISO 812, UNI 7320, DIN 53-546, ASTM D746

Trelleborg Sealing Solutions

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Americas Sales Conference 2007

The Americas Sales Conference was held September 24-28, 2007, in Chicago, Illinois

With 120 in attendance, the conference brought together all of the Americas Sales Engineers, Applications Engineers, General Managers and Executive Management, as well as several European counterparts.

One highlight of the trip was a tour of the Trelleborg Sealing Solutions Streamwood facility, where attendees got the chance to see our new manufacturing plant first-hand, as well as meet all of the Streamwood staff and enjoy some time getting to know one another.

"The conference was a huge success," says Tim Callison, President Marketing Americas. "Bringing everyone together in one location promoted a sense of teamwork that might sometimes be missing when your only communication is via email or telephone. There were several outstanding presentations, and we all enjoyed some fun together. We exchanged many ideas, which I am sure will help us provide even better service to our customers."



All-in-one

The latest catalogs from Trelleborg Sealing Solutions are now available in one handy CD – in English and in many other languages too, 16 in total. These range from German, French, and Spanish to Russian, Czech, Korean and Chinese. An indispensable resource for any engineer specifying seals, the All-in-One CD can be ordered by contacting your local sales office. Alternatively, you can download literature on the website under Service/Download Area.

Check out www.tss.trelleborg.com !



Automated assembly should be easy. When it comes to automatic insertion of seals though, this is not always the case. Trelleborg Sealing Solutions works with leading manufacturers of assembly equipment to ensure it is as simple as possible. With them, we have developed manufacturing and surface technologies to maximize manufacturing speeds and minimize downtime, lowering overall production costs.

Push it Pull it

Trelleborg Sealing Solutions has been working in partnership with leading automated assembly equipment manufacturers such as Ohrmann Montagetechnik in Europe and AMARA in North America for several years. Our objective has been to maximize speed and quality when seals are automatically assembled into components.

Seal developments focus on optimizing automated insertion processes

As manufacturers demand ever-higher velocity and yield, this has made the automatic insertion of seals even more difficult. Seal developments have focused on optimizing the insertion process of seals to make production quicker and more effective, maximizing manufacturing speed and minimizing downtime to lower overall costs.

Firstly, to ensure effective mounting of seals in automated assembly, seals must have sufficient elasticity and be dimensionally accurate. But successful insertion of seals is

not just about these being perfectly flat and round. Other parameters must be considered when it comes to the design of the assembly machine itself and the technology behind the seal.



The key factors making automated assembly work

Trelleborg Sealing Solutions and automated assembly equipment designers have concentrated machine and seal development on the following factors to achieve efficient seal mounting:

- **Detection systems** installed on machines including probes, light barriers and back pressure controls to automatically sense if seals are present
- **Closed assembly tools** to avoid applying local stresses to seals during handling which can fracture or tear seals
- **Coating and surface treatment technologies** to optimize friction characteristics and to avoid contamination of handling and assembly equipment
- **Specification of packaging, transport and storage** to DIN 7716 right up to point of assembly
- **Recommendation of sealing materials** that have sufficient resistance to chemicals and oils along with mechanical properties and slide behavior suited to the assembly process

Shake it

Test programs solve specific automated assembly issues

An example of the way we have cooperated with automated assembly equipment manufacturers is in the identification of the optimum surface treatment of seals for automated assembly. We worked together with them, undertaking numerous test programs to solve specific issues, including one regarding silicone coatings.

Seals are coated with silicone to improve lubrication, which initially gives excellent slide behavior. However, over time the silicone dries, friction properties deteriorate and seals tend to stick during assembly.

Dry coating for O-Rings gives superior long term properties to silicone

Trelleborg Sealing Solutions undertook tests, which clearly demonstrated this reduction in properties. They also established a coating that achieved similar friction

characteristics to the silicone coating when first applied. Being a dry surface treatment though, no lowering of performance was suffered over time. In addition, there was no potential contamination of the assembly system from the coating coming off the seals, a tendency with silicone.

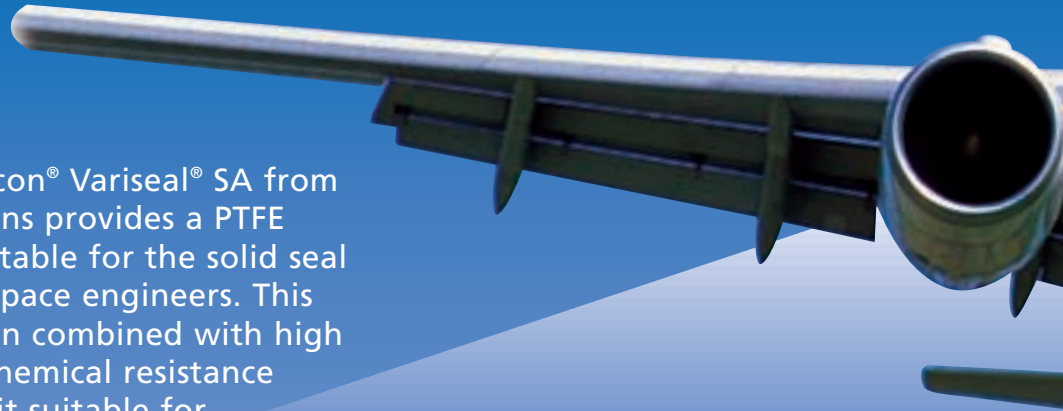


An automated assembly machine will handle thousands of O-Rings in an hour. A great deal of technology is behind making sure that O-Rings move through the equipment effectively to prevent any stoppages.

Launching

Turcon® Variseal® SA

for aerospace applications



The newly developed Turcon® Variseal® SA from Trelleborg Sealing Solutions provides a PTFE based sealing solution suitable for the solid seal glands preferred by aerospace engineers. This seal offers easy installation combined with high temperature operation, chemical resistance and low friction, making it suitable for high frequency aerospace applications such as flight controls.

Aerospace engineers favor use of solid seal glands to simplify seal installation

To house seals, aerospace engineers favor use of a solid seal gland, a simple groove cut into component hardware, to simplify installation. Slipper seals, which are compact in design, can fit into these without a problem.

Turcon® Variseal® is a preferred seal option in aerospace applications

However, the spring-energized Turcon® Variseal® is often a preferred seal option, because it has a number of advantages in aerospace applications. Its jacket of Turcon®, the Trelleborg Sealing Solutions proprietary PTFE based material, is capable of operating in extremes of temperature and is resistant to aggressive aerospace fluids such as synthetic hydrocarbon, petroleum base, phosphate ester and all types of aviation jet fuels. Turcon® also has a very low coefficient of friction, which optimizes sealing load, making it ideal for the high frequency cycling of aerospace primary flight controls.

Turcon® Variseal® SA has been specially designed for solid seal glands

During installation into a solid seal gland, seals need to be compressed substantially. Due to the lip configuration of the Turcon® Variseal®, the spring energizer within it tends to flare its jacket outwards. This makes installation of Turcon® Variseal® very difficult without a split seal gland, especially in smaller diameter housings. The problem is solved with Turcon® Variseal® SA, which is specially designed for closed glands.





Unique Slantcoil allows fitment of Turcon® Variseal® SA even in small diameter seal glands

The unique Slantcoil® spring of Turcon® Variseal® SA is not susceptible to compression set and can accommodate more deformation than other springs during installation. While providing all the inherent capabilities of a Turcon® Variseal®, the Turcon® Variseal® SA is suited for fitment in even the smallest diameter Mil-G-5514F glands.

Turcon® Variseal® SA gives real benefits

“The development of Turcon® Variseal® SA represents a significant product advancement, bringing real benefits to our customers,” says Brian Bowen, Chief Product Engineer responsible for the new Turcon® Variseal® SA at Trelleborg Sealing Solutions Bridgwater. “It expands the use of Turcon® Variseal® in aerospace applications, and as Turcon® Variseal® SA can directly replace slipper seals or O-Rings in standard grooves, Turcon® Variseal® SA can give improved performance in existing housings.”



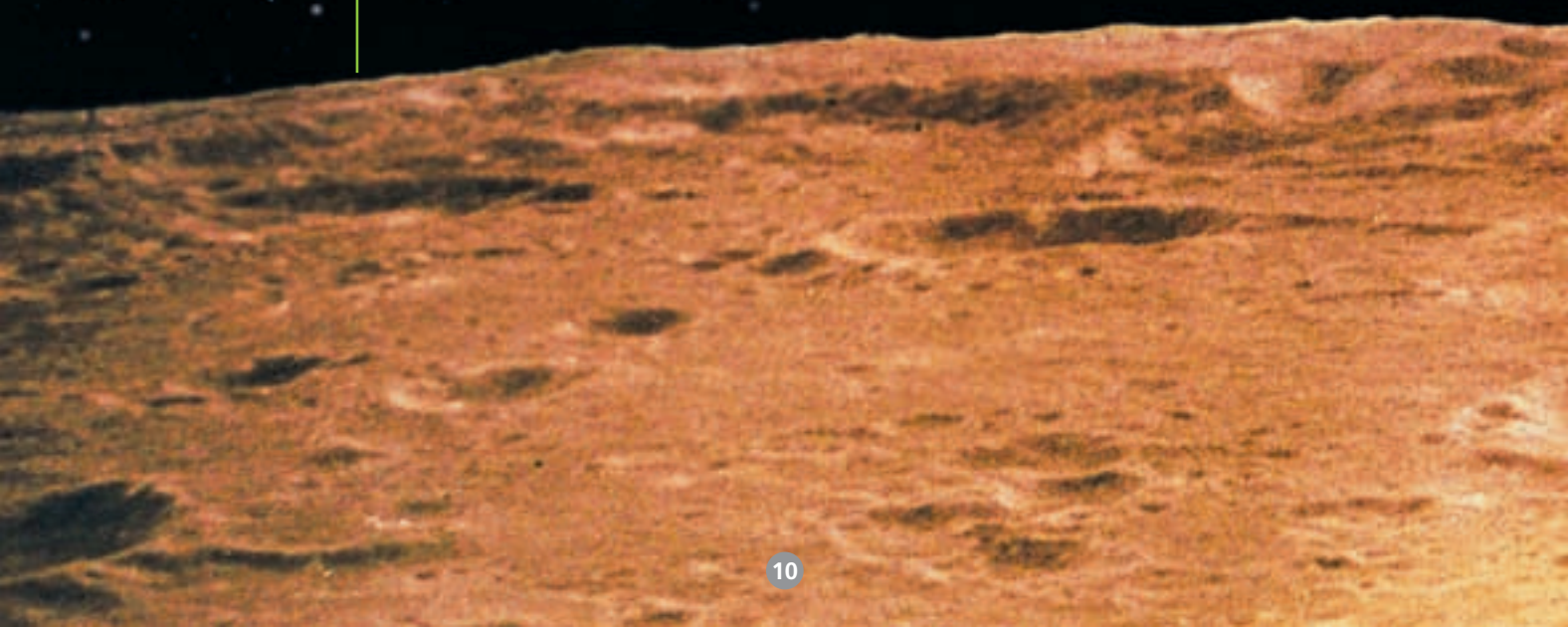
Turcon® Variseal® is a PTFE based seal suitable for the solid seal glands preferred by aerospace engineers



The Indian Space Research Organization, ISRO, is the largest space agency in Asia. In 2008, it will send its first spacecraft to the Moon, making it a dream partner for any manufacturer in the Indian aerospace industry. And at Trelleborg Sealing Solutions, we are one of its suppliers.



Next stop, the **Moon**



One step closer to a manned space mission

India's ISRO (Indian Space Research Organization) recently moved a step further in realizing its plan of a reusable launch vehicle, which will have a rocket take-off, place a satellite in orbit and land like an aircraft. This means India is now closer to the challenge of launching a manned space mission, tentatively set for 2014.

When the space capsule recovery experiment launched into space on January 10, 2007 from the Satish Dhawan Space Centre, Project Director A. Subramoniam told *The Times of India*, "The mission was extremely successful and operated as per the design specifications."

The prime objective of India's revered national icon ISRO is to develop space technology and its applications to various national tasks.

Seals play a crucial role in space applications

Sealing solutions play a crucial role in any space application. In 1999, when ISRO had supply problems with the perfluoroelastomers it was using, it approached Trelleborg Sealing Solutions in India. "We moved in speedily to supply the material used by the organization," says S.N. Ravishankar, General Sales Manager, Aerospace & Defense for Trelleborg Sealing Solutions India.

The next challenge was to have ISRO try Isolast[®], the Trelleborg Sealing Solutions range of perfluoroelastomer materials. "It was not an easy task. They had been using another product for more than 20 years, and they were reluctant to switch," says Bony Paul, General Manager of Trelleborg Sealing Solutions India.

Isolast[®] perfluoroelastomers became the preferred choice

Samples were provided for initial tests and it took three years to get the first inquiry from ISRO. The product was new to the organization and had to be proven through rigorous testing. However, the tests

An exhibition at the ISRO Satellite Centre in Bangalore drew many visitors.



proceeded smoothly and ISRO started procuring Isolast®. "Now their entire requirement of sealing solutions has been transferred to us," Paul says, delighted at serving "such a prestigious client, which automatically gives you a good name in the aerospace market."

Explaining the technical challenges and the crucial role of sealing material in space applications, Ravishankar says that space vehicles use both solid and liquid propellants as fuel, along with highly oxidized media in their engines, booster pumps, etc., and the elastomer is crucial in such applications.

Where other elastomers fail, Isolast® is successful

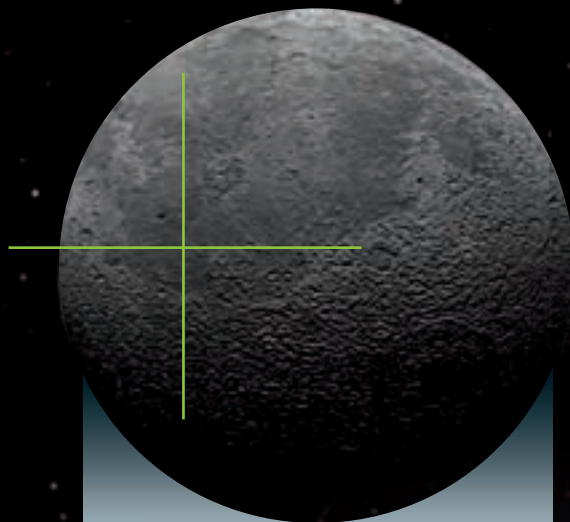
Isolast® can deliver the goods where conventional elastomers fail, as it is compatible with the special chemicals and high temperatures in space applications. This is because it is virtually inert. Its long shelf life (20 years) and low compression set are other advantages. Business with ISRO began with a minor order, but

increased substantially in 2005. Trelleborg Sealing Solutions managers are excited about the future potential. "From 1988 till now, ISRO had only 26 space programs; from 2006–08 it will have more than 20, compressing two decades into three years," says Ravishankar.

Building a partnership with global support

Paul adds that with support from the parent company in Germany and manufacturing facilities in the UK, he has been able to maintain a smooth supply chain to ISRO. Even the challenge of conducting tests for a sensitive and high-security customer like ISRO can be overcome. "Thanks to our good relationship, they conducted the tests on their campus on our behalf," he says.

Paul thinks that with a breakthrough in the space sector in Asia and an esteemed customer like ISRO satisfied with Trelleborg Sealing Solutions products, "our group can build on this experience and other successes, particularly in the US, to support space programs across the world."



ISRO's Polar Satellite Launch Vehicle, Cartosat-1, blasts off from the Satish Dhawan Space Centre.

Aiming for the skies

In 1975, Russia launched Aryabhata, the first Indian satellite. Come 2008, ISRO is scheduled to send Chandrayaan-1, India's first unmanned mission to the Moon. If successful, it will be the sixth global agency to do so. In November 2006, at ISRO headquarters in Bangalore, 80 senior Indian scientists discussed the technological challenges of a manned space mission; the consensus was that ISRO has "the maturity" for such a task.

Set up under the Department of Science, ISRO executes space programs with the main objective of developing satellites, launch vehicles, sounding rockets and associated ground systems. It has achieved several important milestones, the latest being the successful launch of INSAT-4A, by Ariane, and ISRO's Polar Satellite Launch Vehicle, PSLV-C6, both in 2005.

ISRO has extensive international cooperation with countries and organizations such as the European Space Agency, Canada, China, Sweden, Norway, France, Germany and Indonesia. With its mission to "develop space technology and its applications to various national tasks," ISRO has established two major space systems, INSAT for

communication, television broadcasting and meteorological services, and Indian Remote Sensing Satellites (IRS) system for resource monitoring and management. It has also developed two satellite launch vehicles, PSLV and GSLV, to place INSAT and IRS satellites in the required orbits.

For 2008, ISRO has several projects in the pipeline, including the prestigious Chandrayaan-1.

Isolast® perfluoroelastomers give superior sealing

Isolast® is the Trelleborg Sealing Solutions range of high specification perfluoroelastomer (FFKM) compounds. These are terpolymers of fluorine. The absence of hydrogen in the molecular chain dramatically increases both their chemical and thermal resistance. The cross-linked molecular chains enable them to combine the resilience and sealing force of an elastomer with the chemical inertness and thermal stability of PTFE.

Isolast® was capable of meeting demanding ISRO requirements. Virtually inert, Isolast® materials perform well in a broad range of chemical media including organic and inorganic oxides, acids, alkalis, amines, esters and steam at continuous operating temperatures from -25°C/-13°F to 325°C/617°F.

"As ISRO uses chemicals that are highly oxidizing and fuels that are not easily compatible with conventional rubbers used for sealing, Isolast® was the perfect solution for them," says S.N. Ravishankar, General Sales Manager, Aerospace and Defense for Trelleborg Sealing Solutions India.

"From 1988 till now, ISRO had only 26 space programs; from 2006 - 08 it will have more than 20, compressing two decades into three years."

S.N. Ravishankar, General Sales Manager, Aerospace & Defence, Trelleborg Sealing Solutions, India.



New products in the aerospace industry do not appear quickly - and when they do, they must be tested stringently and trusted implicitly because they will affect manufacturing for decades, rather than years. That's the situation with a Trelleborg Sealing Solutions polymer wing seal supplied to Spirit Europe.

Spirit in the Sky

The relationship between Trelleborg Sealing Solutions and Spirit has been long-term

Long and trusting relationships are important in any industry, but all the more so in the aerospace sector, where companies and people traditionally work together on contracts that last for many, many years.

So while the partnership between Spirit Europe and Trelleborg Sealing Solutions might appear quite new on the surface, its roots go back decades.

Jim Martin, Senior Procurement Engineer with Spirit Europe, part of the world's largest independent supplier of commercial aerostructures and systems explains, "Spirit only came into being in 2005 when the investment firm Onex acquired Boeing's manufacturing facilities in Oklahoma and Kansas. Spirit Europe is even newer, arising from the acquisition of BAE's Aerostructures business in April 2006. Despite that newness, I'm still speaking to the same people I did when I first joined the industry 18 years ago."

Partnerships ensure better products, quicker turnaround time and serviceable components

Martin, who regards Spirit's work with Trelleborg Sealing Solutions as a genuine partnership, expects their joint focus on the exacting demands of the aircraft industry today and for the future to stand both companies in good stead. In

the meantime, each aircraft undergoes regular checks and services, which creates demands for parts that must be delivered on time and from a conveniently-placed source.

"Trelleborg Sealing Solutions supplies a whole host of seals for our aircraft wings for Airbus, especially the A320 family. We need our partners to be looking at new technology, weight, noise, new materials and of course cost reduction.

Working towards environmental improvements

Since the Advisory Council for Aeronautical Research in Europe (ACARE) published its Strategic Research Agenda in 2002, the industry has been working towards major environmental improvements. By 2015, aircraft need to be 20 percent more efficient in terms of fuel consumption and 50 percent more efficient in terms of noise. These requirements will create new demands for aircraft, including the next generation Airbus A350 XWB – more than 60 percent of its airframe will be made from new materials.



Seals ease the airflow

The function of an airframe seal on the trailing edge of a wing is to ease airflow. The Trelleborg Sealing Solutions polymer version of a previous, highly specialized leather flaptrack faring seal was developed for the Airbus A320 family, representing half of the world's single-aisle passenger aircraft. Trelleborg Sealing Solutions will supply 370 such aircraft kits this year.

We want products that are recyclable and reusable. We need better products, quicker turnaround time and serviceable components."

Suppliers are not always chosen on price; service, delivery and performance are important too

"These relationships are built over a long time. The aerospace industry is consolidating, and we need to build partnerships in which everyone continues developing and growing. It's not always about price; it's also about services, delivery and performance. Trelleborg Sealing Solutions has been good on all three for years."

Martin says the polymer wing seal developed by Trelleborg Sealing Solutions to replace a leather version is a good example of the partnership principle. "This was a case of a bright idea becoming a best practice. Everything that is done in the aircraft industry is long-term. Any new technology investment doesn't generate benefits in a year or two, but more likely seven or eight years or more."

"We are very much integrated into the supply chain"

In a consolidating industry, suppliers must secure their positions by working higher up the supply chain, creating added value for products and services, and embedding themselves with customers.

"We have been a trusted name in the aerospace business for the last 60 years and the work with Spirit Europe epitomizes the way forward," says Stuart Campton, Sales Director Aerospace for Trelleborg Sealing Solutions UK. "Trelleborg supplies hundreds of seals used in airframes, including dozens for aircraft wings."



Stuart Campton

Supplying whole systems

"Today the goal is to supply systems, rather than just a commodity, and greater integration of the supply chain," he explains. "We supply finished seals. A few years ago, we introduced kitting for wing seals – previously lengths of seal section had to be cut and bonded. Now seals can be picked off the media board and placed in the aircraft component. The board is reusable. That has put us into a partnership position, so we are very much integrated into the supply chain."

Rotating under pressure

One seal does not fit all applications, and some require specialized solutions. With an objective of minimizing leakage, some designs reach their limits. In these cases Trelleborg Sealing Solutions R&D develops alternatives to optimize effectiveness. One of these was the innovative Zurcon® Roto Glyd Ring® S which specifically meets requirements in high-pressure situations where there are slow oscillating movements.



Typical cylinder installed with Zurcon® Roto Glyd Ring® S

Zurcon® Roto Glyd Ring® S - the facts

The Zurcon® Roto Glyd Ring® S is an O-Ring activated double-acting, low friction seal for oscillating and slow discontinued turning applications.

Material		Polyurethane or UHMWPE
Movement	Oscillating	Clockwise and counterclockwise with maximum acceleration of 0,9 m/s ² (2.9 ft/s ²)
	Discontinued Turning	Maximum 30 rpm
	Operation	<ul style="list-style-type: none"> • Maximum operating time 50% (depending on cooling) • Maximum continuous rotation of 2 minutes • P x V, up to 6.5 MPa x m/s
Pressure	Zurcon® Z51	Up to 40Mpa
	Zurcon® Z52 & Z80	Up to 30Mpa
Temperature	Zurcon® Z51 & Z52	-30 to +100°C/ -22 to +212°F
	Zurcon® Z80	-30 to + 80°C/ -22 to +176°F
Operating Temperature		Recommended as 60°C / +140°F max
Media	Zurcon® Z51 & Z52	<ul style="list-style-type: none"> • Hydraulic fluids with good lubricating behavior based on mineral oil or esters • Water-based hydraulic fluids • Cooling and lubricating fluids
	Zurcon® Z80	Air and gasses
Sizes	Zurcon® Z51 and Z52	Shaft and Bore diameters from 10 mm to 2200 mm/ 0.4 inch to 7.2 feet
	Zurcon® Z80	Shaft and Bore diameters from 10 mm to 2700 mm/ 0.4 inch to 8.8 feet



Zurcon® Roto Glyd Ring® S is the ideal seal for indexing tables

High performance polyurethane materials

Zurcon® is the Trelleborg Sealing Solutions proprietary range of polyurethane materials specially engineered for sealing applications. The compounds give superior wear resistance while demonstrating similar mechanical and physical properties as PTFE based materials. Their

hardness is comparable but with more flexibility. In particular, Zurcon® gives outstanding abrasion and wear resistance.

Zurcon® Roto Glyd Ring® S is available in Z51, Z52 and Z80.

Material comparison

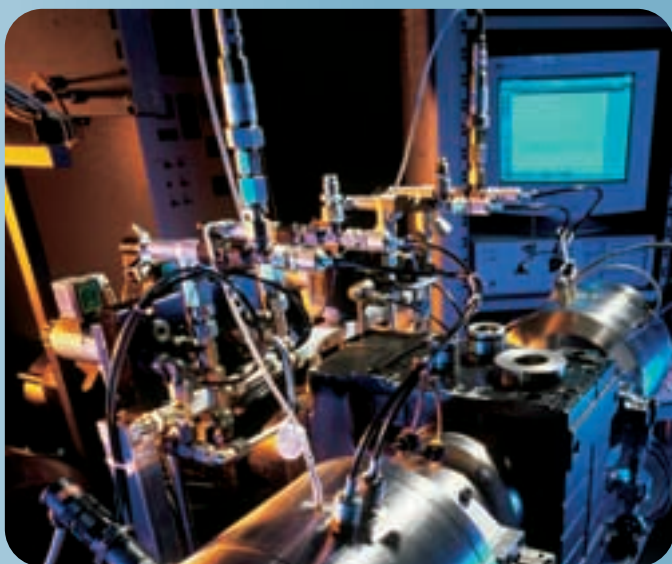
Property	Test Conditions	Standard	Unit	Z51	Z52	Z80
General						
Specific Gravity	23°C/ 73°F	ASTM D 792	g/cm ³	1.20	1.16	0.93
Shore D	23°C/ 73°F	ASTM D 2240	Shore D	68	58	-
Mechanical						
Tensile Stress @ Break	23°C/ 73°F	ASTM D 412	MPa	54	51	45
Tensile Elongation @ Break	23°C/ 73°F	ASTM D 412	%	200	260	600
Deformation under Load	23°C/ 73°F-24h 13.8 MPa	ASTM D 621	%	6.33	9.72	10.51
Creep	23°C/ 73°F-24h 13.8 MPa-1.5h	ASTM D 621	%	1.51	2.27	5.54
Thermal						
Coefficient of Linear Expansion	-75°C to +125°C -103°F to +257°F	ASTM E 831	mm/mm/°K	1E-4	1E-4	1E-4
Color						
				Yellow to light brown	Turquoise	White to off white

Features and benefits:

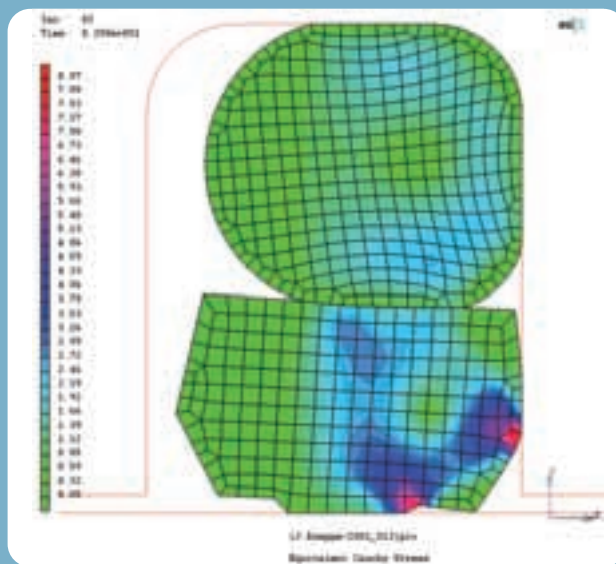
- Excellent wear and extrusion resistance
- Superior friction characteristics
- Exceptional sealing performance
- Enhanced extrusion resistance
- Very good leakage control
- Long service life
- High pressure up to 40 MPa / 5802 psi
- Temperature range from -30 to +100°C / -22 to +212°F
- Standard groove design ISO-DIN 7425/1
- Easy installation
- Shaft and Bore diameters from 10 mm to 2700 mm/ 0.4 inch to 8.8 feet

A wide range of applications covered

- Indexing tables
- Machine tools
- Swivels on off-road vehicles
- Injection molding machines
- Handling devices
- Pick and place equipment
- Multi-channel swivels
- Industrial robots



Test rigs designed and constructed by Trelleborg Sealing Solutions are used for proving the Zurcon® Roto Glyd Ring® S



Finite element analysis was used to develop the Zurcon® Roto Glyd Ring® S

Method of operation

Contact with the shaft is restricted by the second edge of the Zurcon® Roto Glyd Ring® S. This significantly reduces friction and wear while the chamfer on both sides of the seal prevents extrusion into the extrusion gap.

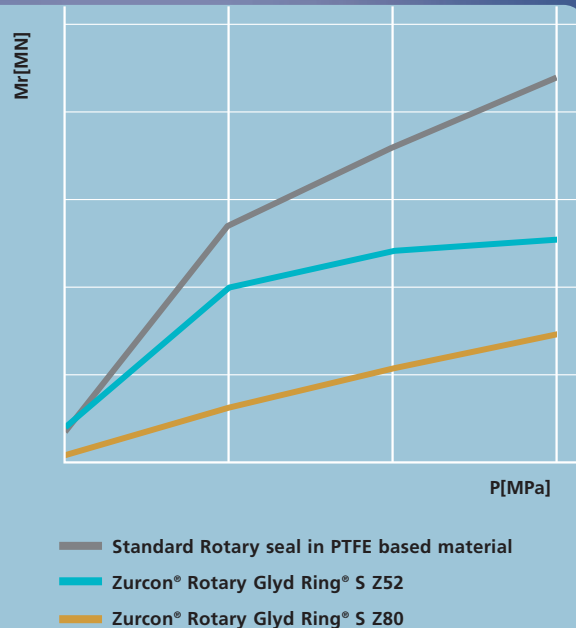
In tests the friction performance of Zurcon® Roto Glyd Ring® S is proven to be better than standard PTFE based rotary seals.

Note:

The test results are only valid for slow rotation or oscillating movements.

The reduced friction of Zurcon® Roto Glyd Ring® S demonstrates the advantages of the design.

Shaft 60mm, 0,1m/s, 50°C



Trelleborg Sealing Solutions



Our manufacturing location in Hudson, Massachusetts supports many processing industries, including biotechnology, food, beverage and pharmaceutical, along with mechanical seals in Isolast®.

Trelleborg Sealing Solutions Hudson has specialized in engineered silicone products since it first opened in 1982. Adding to its portfolio in 2006, the facility began production of Isolast®, the proprietary perfluoroelastomer from Trelleborg Sealing Solutions.

Focus on medical and pharmaceutical sealing

Trelleborg Sealing Solutions Hudson manufactures a broad line of products ranging from silicone tubing to extruded profiles and overmolded assemblies, serving many applications. These include feeding pumps, drug-dispensing equipment and catheters to name but a few. They also supply a unique LIM (Liquid Injection Molding) product for orthopedics and sanitary gaskets used in the food and beverage industry. In addition, LIM 'Y' and 'T' connections on silicone tubing manifold systems for the biotechnology market are available.

All of these products are tested intensively and undergo an extremely rigid validation process. The Hudson facility operates in a controlled

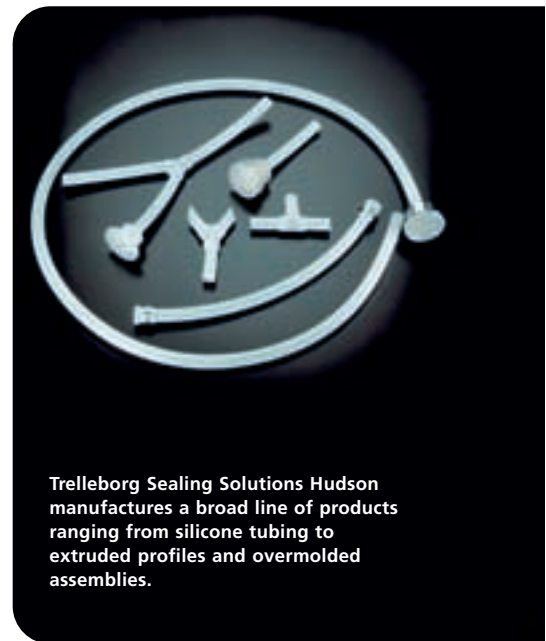
environment to Class 100,000 conditions. This means ambient temperature, humidity and particulate count are monitored continuously. Trelleborg Sealing Solutions Hudson adheres to strict Good Manufacturing Practices as defined by the FDA in the US, and in accordance with quality standards AS9100 and ISO 9001-2000.

Advanced mechanical seals

Trelleborg Sealing Solutions Hudson began exclusive production in the Americas of Isolast®, the company's proprietary perfluoroelastomer (FFKM), last year.

"The facility was chosen by Trelleborg Sealing Solutions in order to bring Isolast® production into a closer alignment with the Global Elastomers Products Group of Trelleborg Sealing Solutions," says James Hederman, Product Manager, Life Sciences at Trelleborg Sealing Solutions Hudson. "To ensure consistency of product quality we manufacture Isolast® matching standards and process to its original production site in Ashchurch, near Tewkesbury UK.

"We share a common mission to lead and support globally the activities in the semiconductor market," continues Hederman. "Isolast® production in Hudson positions Trelleborg Sealing Solutions as a major domestic supplier of FFKM sealing products for this sector in the United States."



Trelleborg Sealing Solutions Hudson manufactures a broad line of products ranging from silicone tubing to extruded profiles and overmolded assemblies.



What happens in Hudson?

Trelleborg Sealing Solutions Hudson utilizes specialized silicone materials to provide solutions for disposable fluid transfer conduits and injection-molded parts. These are used in the medical device, healthcare, biotechnology, pharmaceutical, food and beverage industries. Isolast®, our proprietary perfluoroelastomer material, with almost universal chemical resistance and excellent thermal capabilities, is also manufactured at the Hudson plant.

Serving the medical, pharmaceutical, food and beverage industries

Trelleborg Sealing Solutions Hudson manufactures silicone products for such applications as:

- Enteral feeding pumps
- Dialysis machines
- Surgical trays
- Catheters
- Diagnostic equipment
- Filtration gaskets
- Disposable fluid transfer manifolds
- Disposable closure assemblies
- Processing equipment
- Sanitary fluid transfer
- Fuel cell manufacturing
- Fiber optic sets

About Gish Biomedical

Gish Biomedical, Inc., a CardioTech International company, designs, manufactures and markets disposable medical devices for various surgical specialties including cardiovascular surgery, orthopedics and oncology. All of Gish's products are single-use disposable products or have a disposable component. The company's principal products include custom cardiovascular tubing systems, blood reservoirs, cardioplegia delivery systems, oxygenators, central venous access catheters and ports and blood recovery devices for post-operative use in orthopedic surgeries.

Trelleborg Sealing Solutions Hudson working with Gish Biomedical

Gish Biomedical of Rancho Santa Margarita, California, awarded Trelleborg Sealing Solutions Hudson a contract to produce multi-lumen tubing and liquid injection overmolding connectors for their Central Vascular Access Catheters. The award was based on our years of experience within the life science market producing high quality engineered solutions.

The challenge of producing multi-lumen tubing while maintaining the orientation of the feeding lines was met by using both extrusion and liquid injection molding. This medical manufacturing is undertaken in Trelleborg Sealing Solutions Hudson state-of-the-art FDA-registered facility in Massachusetts.

Did you know?

Trelleborg Sealing Solutions Hudson is one of only a few medical manufacturing facilities in the US to be FDA registered to manufacture Class II medical devices.

The turn of the screw



Furniture manufacturers and other woodworkers expect ever-increasing productivity from their equipment. These high expectations apply to the Weeke multi-jackscrew drilling machines, and to meet these, Weeke has developed a new range of drill power trains. Zurcon® QUAD-RING® seals from Trelleborg Sealing Solutions have helped contribute to their success.

Weeke develops woodworking equipment to increase customer productivity

Making woodworking more effective is a key objective of the mechanical engineering company Weeke, who produces CNC (Computer Numerical Control) machines for furniture manufacturers and other companies handling wood. Constantly improving their equipment to increase their customers' productivity, they have enhanced the performance of their dowel drilling machines with new drill power trains.

Peter Kortenjen, who heads up development at Weeke, outlines their objective in the new drill power train.

"Firstly, we wanted to greatly reduce the machine's setup time. To do this we concentrated on its



Peter Kortenjen

electronic program control, enabling complete construction of a furniture component without a tool change. Secondly, we wanted an alternative to the usual method of positioning the jackscrew drills. Traditionally these are positioned using pressure from pneumatic cylinders, but we wanted to incorporate a mechanical locking device as well."

Existing seals were not effective in high temperatures

The resulting solution is a drill power train where up to 40 jackscrew drills can be controlled individually. CNC control enables integrated cylinders within each jackscrew to be lowered, automatically locked, lifted, repositioned and locked again, in programmed sequences, as many times as required, until the furniture component is complete.

To allow the drill to work within a grid of only 30 mm/ 1.2 inches, the jackscrews needed to have a small circumference. To achieve the required load ratings, several ring-grooved ball bearings were positioned together within the jackscrews. This caused them to heat up to 80°C/ 176°F. In these operating conditions the existing NBR seals were sticking to their housings, especially after periods of rest. Potentially this could lead to the jackscrews being damaged and consequential downtime for the machines. Lubrication was not an option to prevent this, as this media caused the NBR material to harden and become brittle.

Zurcon® QUAD-RING® met all operating criteria and enhanced performance

The solution proposed by Trelleborg Sealing Solutions was to replace the NBR seals with a QUAD-RING® in Zurcon® Z90, one of our proprietary polyurethane materials specially developed for sealing applications. Its excellent friction characteristics prevented sticking to the housing, even after extended periods of rest, while its high temperature capability means it easily withstood operating conditions.

"We are happy with the sealing solution," says Peter. "Not only have we prevented sticking to the cylinder but also eliminated wear due to friction. An added benefit of the improved friction characteristics has been that the jackscrews now only reach temperatures of 60°C/ 140 °F. This is contributing to the overall better performance of the power train."

Weeke - A story of success

Part of the Homag Group, Weeke, based in Herzebrock-Clarholtz, Germany, develops and manufactures high quality machinery for the woodworking industry and carpentry. Founded over 60 years ago, it was responsible for the first lock insertion machine in 1954, which revolutionized wood processing. Innovation is a key part of their philosophy, and in partnership with their customers they solve woodworking challenges, making the most effective woodworking equipment possible.

Simple NBR seals were replaced with QUAD-rings made of Zurcon® Z90

Woodworking machines made by Weeke have an excellent reputation

The European woodworking industry

Europe is the world's largest furniture producer, with the woodworking industry in general employing almost 3 million people, with a turnover of €165,000/ \$234,000 million annually. Mainly small and medium sized enterprises (SMEs), there are estimated to be around 131,000 businesses in the wood industry and 136,000 manufacturing furniture.





Smallest

will
soon
be

biggest

Windows that clean themselves, material that is light as a feather and stronger than steel, an elevator into space... In the world of nanotechnology, fantasy and reality converge.



Martin Magnusson is Liaison Scientist at the Nanometer Consortium, University of Lund in Sweden. He serves as a link between research and the business sector.

Through the relatively new nanotechnology, the future is already here. The possibility at atom level of mixing physics, chemistry and biology to produce new materials with customized properties opens the way for highly innovative products and applications in a number of areas.

Nanoscience has become perhaps the most prominent area in research and, in the long term, nanotechnology could become the hub of a new industrial revolution. But what is nanotechnology?

In the new, advanced nanolaboratory at the Lund Institute of Technology, Martin Magnusson serves as a link between research and the business sector at the interdisciplinary Nanometer Consortium.

"Nanotechnology is used to manufacture articles on the scale of 1–100 nanometers and to make use of these structures. Nanoscience is about the aspects that are specific to such small systems and what can be done with the help of nanotechnology," he says. The central feature of nanoscience is that a material's properties are changed at nano level.

For physicists, this phenomenon means that a new type of physics occurs; chemists can achieve more accurate measurements and create new structures. In biomedicine, it is possible to measure individual molecules, and materials scientists can create new materials.

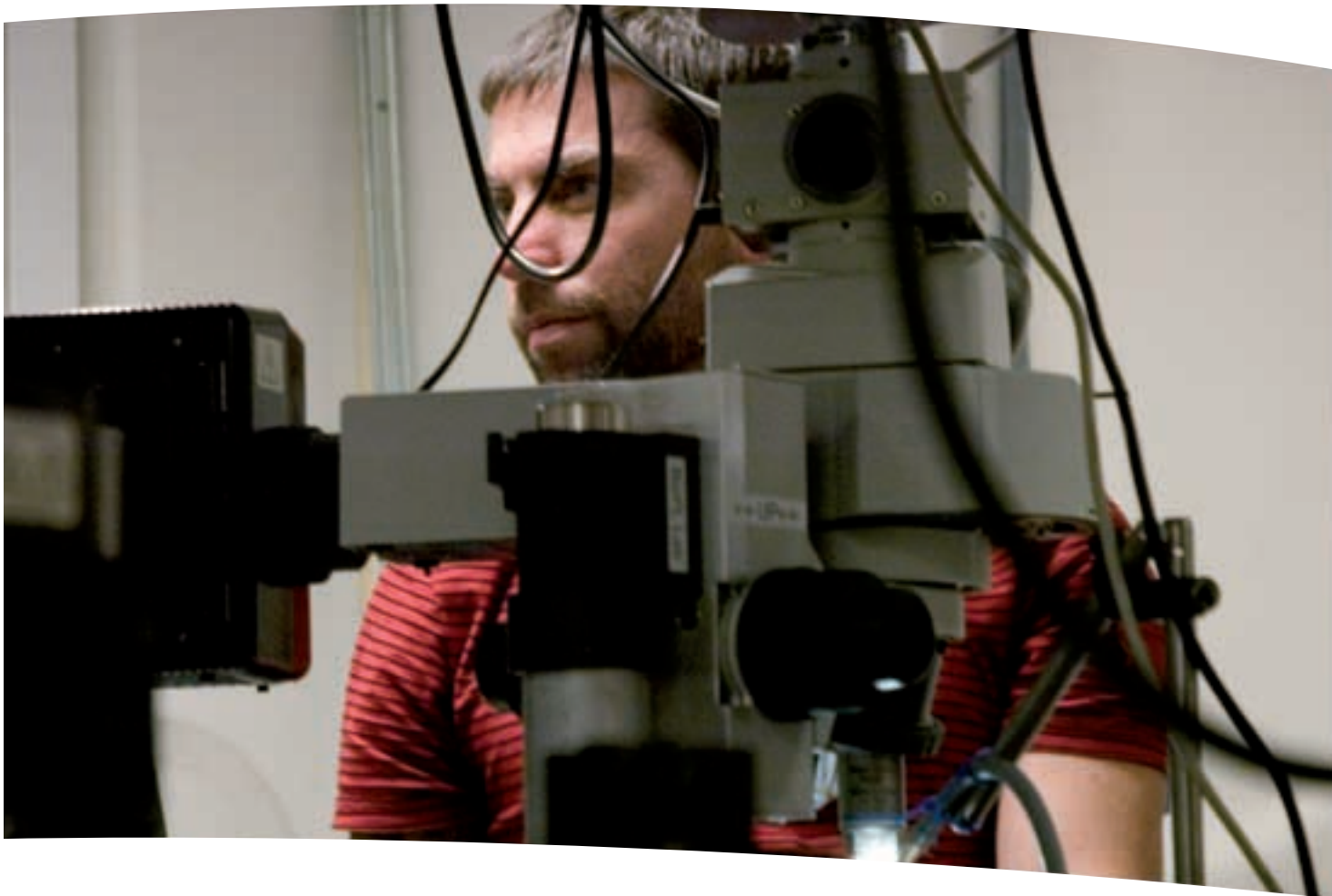
"For example, gold has certain material properties. But if you take a single gold atom, it has none of these,

except perhaps the density. At nano level, it is also possible to mix materials in a way that would be impossible if they were bigger. This facilitates the creation of new, exciting composite materials."

There are already a number of products based on nanotechnology: car tires with superior wear properties, stainless textiles and ultra-thin surgical needles. The self-cleaning windows are also reality, but we will probably need to wait for NASA's nanovision of using ultra-thin, extremely strong wires to take an elevator straight out into space – although it is already possible in theory.

"The area is usually divided according to application: electronics, medicine and material. We are





becoming increasingly effective at creating material with more controlled properties. They can become stronger, lighter, conduct heat better or less well... Whatever it is we want them to do," says Magnusson.



Using nanotechnology, a manufacturer has succeeded in producing a synthetic rubber that has improved heat resistance, elasticity and flexibility. With nano-size particles, it is even possible to reinforce silicone rubber so that it becomes both transparent and robust.

"One of the most exciting features is combination solutions that involve mixing active elements and sensors from biology and physics in materials science. There has been success in creating air-cleaning and self-washing concrete, and work is being conducted on self-repairing plastics. By nanostructuring surfaces, attempts are also being made to make them self-sealing so that no packing is needed," says Magnusson.

Slowly but surely, researchers are developing nanotechnology, but the mass-production of nanostructures with sufficient precision remains the stuff of science fiction. The integral complexity of the technology means that costs become too high.

"It will be some time before it takes 18 months from the research lab to industry earning money on a solution. But there is plenty that can be done, and companies have to tell us researchers what they need. There is nothing we want more than to cooperate with industry," says Magnusson.

Quantum leap

A key focus for nanotechnology is the quest to produce the quantum computer. Following the laws of quantum physics, the quantum computer would have enormous processing power through the ability to be in multiple states and to perform tasks using all possible permutations simultaneously. Nanotechnology is a key element to making this dream a reality.

The initial implementation of nanotechnology will help make chips that are smaller, faster and more powerful. It is estimated that by 2015 the spend on nanotechnology-based applications will be major in the semiconductor industry with investment in developments increasing year on year.

Developments in nanotechnology:

- The 90 nm node is already in production, and the industry is working toward 63 nm.
- In lasers quantum wells are to be substituted with quantum dots produced from nanometer-sized crystalline particles.
- Nanowire technology will allow the pushing of electrons into ever smaller spaces.
- Films are in development made of carbon nanotubes (CNTs) and nanoparticles to help make chips smaller and faster.
- Spintronic theory has led to nanoscale devices that increase read head sensitivity of a hard disk drive, significantly expanding storage capacity.
- Self assembly on hard disks is resulting in higher percentage particle alignment, giving greater magnetism and more storage in the same space.
- Nanoimprint lithography is moving from the 32 nm mode to 1 nm dimensions.

A millionth of a millimeter

Within nanotechnology, researchers work with individual atoms, making it possible to move atoms, create new materials and change the properties of existing materials. An atom is about 0.2 nanometers in diameter and you get one nanometer if you divide one millimeter a million times. One nanometer has the same size in relation to a tennis ball as the tennis ball has to a globe.

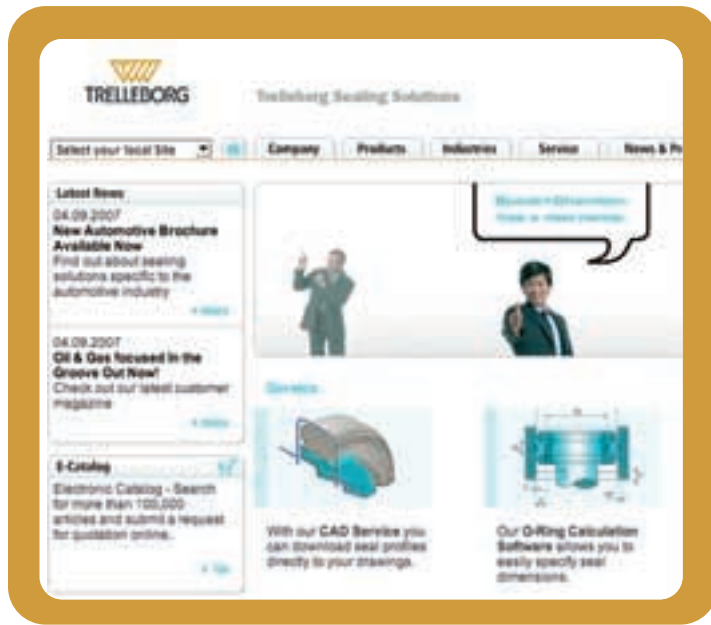
The name nanotechnology was first used in the 1970s. A breakthrough was achieved in 1981 with the invention of the scanning tunnel microscope, which meant that it was possible for the first time to see the surface of atoms and to actually touch individual atoms.

Sealing - the future - with nanotechnology

"As our customers' equipment moves into the nano-dimension so will our sealing products," says Elke Voehringer-Klein, European Semiconductor Segment Manager. "Certainly sealing in these microstructures will present new and possibly yet unknown challenges. We expect our sealing materials will have to embrace nanotechnology too.

"Research and development is increasingly being devoted to the development of the ultimate that can be accomplished from nanotechnology: the intelligent seal. In the meantime we are seeing, in response to demands from the semiconductor market, focus on material fillers based on nanotechnology principles. These organic compounds offer increased resistance to chlorinated and fluorinated gases, high temperatures and harsh process chemicals while lowering particulation."





Think global Speak local

Globally delivering equally high levels of service and technical support for your sealing solutions, Trelleborg Sealing Solutions offers an international network of over 70 facilities worldwide. This includes manufacturing sites, strategically positioned research and development centers and over 40 internationally linked marketing companies at your service.



Online customer service

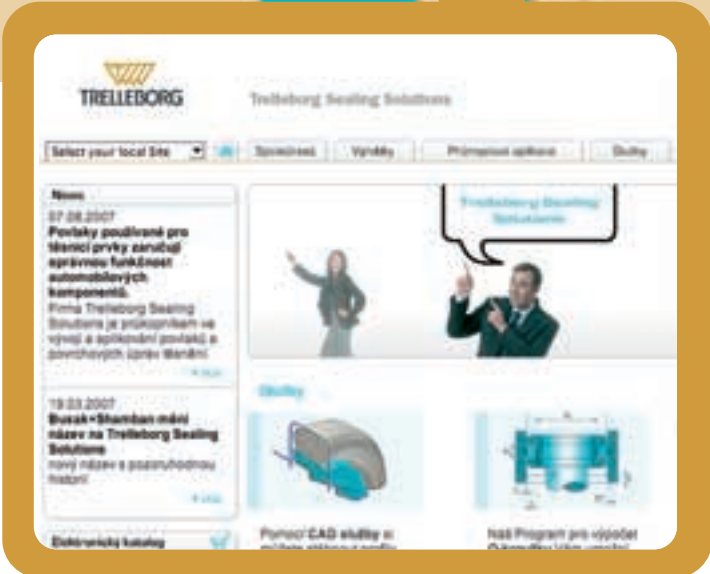
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With 30 strategically located worldwide manufacturing sites and a commitment to best-practice techniques in lean manufacturing, we undertake leading processes and cost-effective manufacturing in each region. Fully integrated production facilities, each one specializing in a specific product line or material family, ensure the highest quality standards, from design and compound formulation to product manufacturing, final assembly and shipping. Our in-house offering is complemented by a network of proven quality third-party suppliers enabling us to provide you with the complete range of polymer sealing and bearing solutions.

Research & Development



We have our own first-class Research and Development Centers from where we carry out an ongoing program of new materials and product development. By working in close cooperation with our industry partners worldwide, we are able to offer customers distinct competitive advantages.

Product information in your language



Product literature is available in over 16 languages and can be downloaded from our website.



Application engineering support just around the corner

The aim of Trelleborg Sealing Solutions is to facilitate customers in the achievement of cost-effective, durable solutions that match their specific business requirements and needs.

Over 350 Sales and Application Engineers globally delivering equally high level of...

- Local support in over 40 countries
- Individual sealing solutions for dedicated markets and applications
- Product testing supported by product management and R&D
- Development partnerships

Contact your local Trelleborg Sealing Solutions Marketing Company – your one-stop-shop for sealing solutions – at

www.tss.trelleborg.com



Supply Chain Management



We have completely aligned our logistical support to match changing customer needs and provide an efficient chain of delivery at economic cost. Over 40,000 different seals and sealing systems are shipped from the various manufacturing sites to our central Logistics Centers in Europe, Asia and America.



Trelleborg Sealing Solutions at a glance

- A business area of the Trelleborg Group
- Employees: 5700
- Research and Development Centers in Europe and America
- 30 manufacturing plants worldwide
- 40 Marketing Companies globally
- Quality Certifications: ISO 9001:2000 and ISO/TS 16949:2002
- In-house polytetrafluoroethylene, polyurethane and elastomer development
- More than 2000 material formulations
- Worldwide distribution network

Contact your local Trelleborg Sealing Solutions
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