Oil & Gas

Getting the connections right

Seals for connectors on subsea pipelines for oil & gas transport

Bicycles

Pedal power

High-tech cycles have advanced sealing systems

Aerospace

Aero engines are a hot topic

New developments make sealing more challenging
Oil & Gas

Getting the connections right

Trelleborg Sealing Solutions provides seals to Flexible Engineered Solutions for Hot Stab Receptacle Connectors to be used on a subsea pipeline that will bring gas all the way from Russia to continental Europe.

Bicycles

Pedal power

Find out more about advanced sealing systems supplied for A-Pro Tech’s shock absorbers used on high-tech cycles.

Aerospace

Aero engines are a hot topic

Outlined in this article are the trends and opportunities within the challenging aero engine market.
Getting together has benefits
Cooperation within Trelleborg Group results in the development of an innovative metal to rubber bonded sealing solution

Great resistance
Isolast® J9876 gives the most comprehensive media resistance

Handle with care
Trelleborg products in food and beverage processing equipment

Pumping well
Sealing solutions for TriContinent Scientific’s syringe pumps

The world on show
Trelleborg will be at the world’s largest expo ever

One page of the document contains a table of contents with sections on Oil & Gas, Aerospace, Marine, Food and Beverage, Life Sciences, and Automotive. Each section includes titles and brief descriptions of the content. The document appears to be about Trelleborg’s products and their applications in various industries.
Continuous updates

Our online services are continually being updated and expanded. Always trying to make the lives of engineers easier, we have some recent and upcoming additions to our suite of best-in-class E-tools.

The industry-leading Sealing Solutions Configurator is now available in German.

The Configurator is the first tool of its kind offered by any seal supplier and allows engineers to identify a proven sealing solution for their specific application. Users can configure the solutions for their applications and store them in a project area. Once a project is stored the user gets access to additional services through the tool, such as downloading the corresponding CAD drawing of items recommended, creating a PDF of the configuration result, sending a request for quotation or request for advice.

Also, watch out for a new Configurator video on our YouTube channel.

The Chinese version of the O-Ring Calculator is coming soon!

With a number of unique functions, the O-Ring calculator is wholly intuitive and easy to use. It includes a sizing capability, design parameter recommendations and complete measurements, and results and comments may be printed, saved online or filed as a PDF.

And last but not least, the Portuguese-language website is already live.

The site, www.tss.trelleborg.com/br, is aimed at our growing Brazilian customer base.

The full-service website means that customers in Latin America now have access to all Trelleborg Sealing Solutions news, product and material information and E-Tools in Portuguese. Our customers in Latin America can get local support from the Trelleborg Sealing Solutions Brazil marketing company located in São Paulo.
**Going for gold**

Trelleborg Sealing Solutions marketing company in the UK and the Trelleborg Sealing Solutions manufacturing site in Tewksbury, England have been awarded UTC Supplier Gold status by Claverham Ltd, a United Technologies Corporation company. This followed several months of intensive improvement, analysis and business assessment work.

Supplier Gold is a program established by the United Technologies Corporation to drive supplier performance and to recognize key suppliers for their excellence.

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**Responding to market challenges positively**

Trelleborg Group issued its annual report in February 2010.

President and CEO Peter Nilsson says, “In an exceptional market situation, our organic sales for the full-year 2009 declined 21 percent compared with 2008. By focusing on our most valuable businesses, quickly adjusting our capacity and increasing the speed of the ongoing action programs, we have adjusted our operations.

“The development of the demand going forward remains uncertain. We have now however a more efficient structure with increased flexibility to accommodate future market changes. The Group’s strategy remains. The priorities include continuing to improve the company’s structure and geographic balance, increasing synergies in the Group and refining the product portfolio.”

You can see the complete annual report at www.trelleborg.com/annual-report2009

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**Exhibitions**

This year we’ll be exhibiting at a number of major exhibitions.

We started off at Medtec in Germany. It’s off to Houston, Texas in the U.S. for the Offshore Technology Conference (OTC) from 3 to 5 May. Then we jump over the Atlantic to Aberdeen in Scotland for All Energy, taking place 19 to 20 May and to Shanghai for Tunnel China from 19 to 21 May. Also in May (26 to 27), we’re at the Euro Expo Eskilstuna in Sweden.

An event that happens every two years, we have a presence at Farnborough International Airshow from 19 to 25 July. The International Sealing Conference, where we will be a key presenter, is on the 12 to 13 October. We are then participating in two further exhibitions in Shanghai, PTC Asia from 25 to 28 October and Bauma China from 23 to 26 November.

Find out more about OTC on page 9 and the Farnborough International Airshow on page 29.
Trelleborg Sealing Solutions provides seals to FES for Hot Stab Receptacle Connectors to be used on a subsea pipeline that will bring gas all the way from Russia to continental Europe.

In short...

- Huge pipelines for transport of oil & gas are being laid to link Russia with Continental Europe.
- Flexible Engineered Solutions has been commissioned to supply large Hot Stab Receptacle Connectors for one of these pipelines.
- Trelleborg Sealing Solutions provides a sealing solution for the connectors.
As the Russian gas reserves come on stream, effective transportation has become a focus for the oil & gas industry. Huge pipelines are now being laid linking Russia with Continental Europe. One of these is the Offshore Trans-Baltic pipeline, which will transport natural gas from Vyborg compressor station at Portovaya Bay, Russia, along the bottom of the Baltic Sea to Greifswald in Germany.

**Large Hot Stab Receptacle Connectors required for the Trans-Baltic pipeline**

As part of the project Saipem, who are constructing the pipeline, have commissioned Flexible Engineered Solutions Ltd. (FES), a UK company, to supply 24 Hot Stab Receptacle Connectors to be installed at varying stages of the pipeline. These are used to connect an exterior device to an existing hydraulic flow, allowing a variety of operations to be carried out within the pipeline, usually utilizing a Remotely Operated Vehicle (ROV).

A standard Hot Stab Receptacle Connector is six to 100 millimeters/ a quarter of an inch to four inches in diameter. For this project though Saipem commissioned unusually large connectors of 200 millimeters/ eight inches in diameter to achieve a greater flow rate and minimize pressure loss.
Maintaining pressure integrity is vital

“To make sure such large Hot Stab Receptacle Connectors work they must be retractable with internal and external pressure,” says Richard Pattison, Design Engineer, FES. “For this reason we incorporated a hydraulically driven sliding Hot Stab. This is used to overcome the Hot Stab seal installation and retraction loadings. The biggest issue as far as the seal design goes is maintaining pressure integrity.”

The Hot Stab Receptacle Connectors were subjected to an extensive testing program including fit, function and hydrostatic pressure tests. Hydrostatic testing was performed to over 7 MPa/ 1,000 Psi for a duration of over two hours. Results were favorable.

Testing proved the solution worked

“Testing is necessary to ensure that the Hot Stab Receptacle Connector is supplied to project in accordance with the capability and function as defined in the contract,” continues Richard. “That it is capable of maintaining pressure integrity, fit and functions as per the design.

“We approached Trelleborg on this particular project because we have a long history of successfully utilizing Trelleborg sealing systems within Hot Stab Receptacle Connectors,” says Richard. “The sealing system has been used in our Hot Stab Receptacle Connectors since 2002 and the relationship between the companies is built upon mutual understanding and assistance. Although new business is never a guarantee, FES is certainly hopeful that the successful supply of the sealing system for the Baltic pipeline will result in future business.”
From Russia to Germany

The Offshore Trans-Baltic pipeline is commissioned and operated by Nord Stream UK and will transport natural gas from Vyborg compressor station at Portovaya Bay along the bottom of the Baltic Sea to Greifswald in Germany.

The offshore section of this pipeline is being constructed by Italian company Saipem and will be 1,223 kilometers/780 miles long and 1.22 meters/48 inches in diameter with a wall thickness of 38 millimeters/1.5 inches. Gas will be pumped at 22 MPa/3,190 psi pressure with two parallel lines being planned to provide an annual capacity of 27.5 billion cubic meters/971 billion cubic feet.

The first section of pipe is being built at present and is scheduled to be operational by 2011. The second leg of the pipeline is due to be constructed by 2012.

Offshore Technology Conference 2010

Trelleborg Sealing Solutions exhibits at the Offshore Technology Conference (OTC) in Houston, Texas, U.S. from May 3-6. Showcased are our XploR™ range of Explosive Decompression Resistant materials, as well as several other industry-leading products and materials.

Founded in 1969, the Offshore Technology Conference is the world’s foremost event for the development of offshore resources in the fields of drilling, exploration, production, and environmental protection. OTC is held annually at the Reliant Center in Houston.

Each year, OTC attracts more than 60,000 attendees and 2,000 exhibiting companies representing more than 110 countries.
Whether on the seabed, topside, down hole or downstream, Trelleborg Sealing Solutions systems meet the challenges of today's oil & gas applications. While doing this we continually research the geometries and materials to meet the challenges of tomorrow. For extreme pressures and temperatures in aggressive media, special materials and designs are required. Here we feature just a few of our industry-leading solutions.

**Turcon® Wedgpak®**

The Turcon® Wedgpak® consists of a proprietary triangular elastomeric sealing element that is supported by two delta-shaped anti-extrusion rings. These prevent the elastomeric sealing element from spiralling or rolling under severe working conditions.

The Wedgpak® anti-extrusion rings also provide support and extrusion protection for the elastomeric sealing element. The small elastomeric contact area of the Wedgpak® design results in slipper seal-like performance, with low dynamic friction. At the same time, the elastomer wipes the sealing surface efficiently, providing excellent leakage control.

A full range of sizes is offered to fit all AS-568 and ISO-3601 groove standards. Custom designs are available upon request.

**Wills Rings®**

Wills Rings® are the original metal seals engineered for use in extreme conditions where the capabilities of polymeric seals are exceeded.

Operating in temperatures from cryogenic up to +80°C/+1562°F, Wills Rings® withstand pressures from hard vacuum up to 1,000 MPa / 145,038 psi. They are ideal for static sealing of connectors, flanges and plates.

Wills Rings® are available in a wide range of metals, both in O-cross section or C-cross section with either pressure-filled or system pressure activation.
Turcon® Variseal® offers major benefits in the design of components such as hydraulic, downhole, and topside equipment.

Turcon® Variseal® is available in a range of geometries and designs that allow the optimum profile to be selected for each application. They can be produced from a wide range of Turcon® materials, our proprietary PTFE based compounds. These are specially formulated for sealing elements and offer superior characteristics specifically matched to the demands of our customers.

When required, Variseal® can also be manufactured in Zurcon®, our proprietary range of non-PTFE plastic based materials.

**Features & benefits**

- Excellent leak tightness
- High resistance to wear
- No extrusion into gaps (when used with Back-up Rings)
- Withstanding aggressive and abrasive process media
- Extensive temperature capabilities
- Low friction
- Compact form
- Simple installation

Turcon® Variseal®

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**XploR™ range**

Best-in-class elastomers, including specially engineered and optimized EDR compounds

The XploR™ range from Trelleborg Sealing Solutions is a suite of advanced elastomers especially developed for oil & gas applications. The portfolio includes compounds in HNBR, FKM and Isolast® Perfluoroelastomer (FFKM), each of which is qualified to both the immersion and EDR requirements of NORSOK M-710.

The first FFKM on the market to meet NORSOK M-710 RGD test conditions

Isolast® XploR™ J9513 is the first perfluoroelastomer on the market to meet the requirements of this stringent RGD and immersion test.

**Features & benefits**

- Each material demonstrates unrivalled Explosive Decompression Resistance (EDR) within its material type
- Temperature resistance over a broad range
- Exceptional mechanical performance
- Low long-term compression set
- Excellent chemical compatibility
- Isolast® XploR™ J9513 gives almost universal chemical compatibility
- Long life in aggressive media, including hydrocarbon and aqueous media, common within oil & gas applications
- High modulus, high strength
- Material compliant to NORSOK M-710
The new material is part of the Isolast® range of proprietary perfluoroelastomers from Trelleborg Sealing Solutions. In addition to this universal material the range includes a number of compounds specifically engineered for the requirements of the chemical processing, semiconductor fabrication and oil & gas industries.
Ideal for mixed chemical streams

- Isolast® J9876 has a continuous operating temperature range from -7°C to +275°C/ +19°F to +527°F with occasional peaks up to +315°C/ +599°F.

- Specifically developed to cover applications in mixed chemical streams including acids, bases, amines, steam, ethylene and propylene oxides, the material’s unrivalled media resistance at high temperatures means it has excellent long-term physical property retention.

- The compound is available in all O-Ring sizes, as gaskets, molded parts or rubber-to-metal bonded components including door and gate seals.

- It is suitable for mechanical seals, chemical processing systems, pumps, valves, power generation equipment, refineries and semiconductor applications not directly exposed to plasma sources.

Isolast® J9876 is suitable for use in a wide range of industries including oil & gas production, chemical processing and semiconductor fabrication.
The food and beverage processing industry is one of the most highly regulated industries and faces unique challenges, not least hygienically.

The food and beverage processing industry is one that impacts on all our lives, handling virtually all that we eat and drink. We rely on processing companies to deliver the product we want, where we want it, in the form we want and most importantly, reliably safe. Regulations are stringent and globally controlled through major government bodies such as the Food and Drug Administration (FDA) in the U.S. and the European Food Safety Authority (EFSA).

Trelleborg contributes to ensuring the hygienic production of food and beverages. Many of its products are integral to processing equipment such as the thousands of seals used in a typical processing line. It is vital that there is no risk of these contaminating the system. That means that they must be compatible with sometimes aggressive process media and withstand the stringent cleaning regimes involving destructive chemicals.

Special hoses and couplings are also provided by Trelleborg. These are used in everything from dry goods transport to wine production. Trelleborg’s vibration isolation solutions are used under the base of food processing equipment.

Further information
www.tss.trelleborg.com
www.trelleborg.com/engineeredsystems

Seals for filling heads
Ultra clean seals prevent leakage and ensure there is no contamination at the critical filling stage of production.

Trelleborg products: Variseal®, Ultra-Clean™, O-Rings

Hoses meet standards
Trelleborg supplies a wide range of hoses and couplings for food processing applications. These are designed and manufactured with hygiene in mind. Compounds are compliant with global food standards, while smooth extruded inner tubes can withstand aggressive cleaning regimes. This combined with specially designed coupling systems means no bacterial growth is possible on hose assemblies.
Seals for Rotary distributor and bearings

The rotary mechanism distributes the media being processed around the processing system. Special dynamic seals keep grease, cleaning fluids and water out of rotary bearings.

Trelleborg products: Roto Variseal®, Turcon® Varilip® PDR, X-Ring, radial oil seal

Seals for valves in the filling mechanism

Valves control the amount of liquid fed into the bottle. Low-friction seals that withstand aggressive cleaning regimes are required in these dynamic applications.

Trelleborg products: scrapers, molded components, Glyd Ring®, wipers

Seals for bottle lifters

Seals are required for the pneumatic pistons within the cylinders that lift the bottles for filling. The low-friction and wear resistance of seals are important to maximize productivity.

Trelleborg products: Slydring®, Glyd Ring®

Seals for hygienic-design couplings

Hygienic-design couplings are located at virtually every connection in the system. Gaskets and seals must withstand stringent cleaning-in-place regimes to give long-life and no contamination.

Trelleborg products: sanitary gaskets, O-Rings

Anti-vibration isolation

Isolation systems reduce vibration to the support structure of equipment by up to 90 percent and significantly lower noise levels. Products are supplied in a variety of different polymer compounds along with silicone and stainless steel for critical food production applications.

Trelleborg products: Cushyfoot, TF bushes
Sealing in syringe pumps can be challenging. Plastic-type plungers made of a variety of materials act as pistons that ride in bores generally made of glass or ceramic. Seals are often incorporated into the tips of the plungers, sometimes resulting in one-piece components.

Solution required to prevent premature seal failure

Trelleborg Sealing Solutions supplies an integrated spring-energized seal to the world’s leading syringe pump manufacturer, TriContinent Scientific. The two companies worked together on development of a novel seal design for a new pump platform to solve a problem that one of TriContinent Scientific’s customers was having with a competitor’s product. Premature seal failure was being caused by reagents adhering to a ceramic piston and deteriorating the seals.

Using TriContinent Scientific’s own patented seal design, engineers at Trelleborg Sealing Solutions Broomfield, U.S. were able to modify the seal and provide a sealing solution. This was an integrated polymer dynamic seal with a HiMod® 550 custom-shaped energizer within a custom ultra high molecular weight polyethylene (UHMWPE) jacket. HiMod® is a glass fiber reinforced thermoplastic material and avoids any issues connected with the use of a metal energizer.

Enhanced seal design boosts performance

The seal design met the requirement of preventing premature seal failure. It proved to outperform its predecessor by providing much more consistent force on the sealing lip which resulted in extended seal life and eliminated instrument downtime.
Trelleborg Sealing Solutions supplies an integrated spring-energized seal to syringe pump manufacturer, TriContinent Scientific.

“The success of this syringe pump design hinged on finding the perfect seal material and configuration,” says Mik Bajka, Engineering Manager from TriContinent Scientific. “We could not have asked for a better outcome. Our reputation is built on delivering high value, reliable, and innovative products to our customers, and we were able to do that here. Working with Trelleborg Sealing Solutions engineers, we solved our customer’s problem and produced another quality component for the critical in vitro diagnostic industry.”

About TriContinent Scientific

TriContinent Scientific specializes in liquid-handling products and instrument components for the medical diagnostics and biotechnology industries. Established in 1975, the ISO 13485 certified company (UL-registered firm) joined the Hitachi Chemical Company family in 1996. The company designs and produces syringe pumps, valves, laboratory automation products, pipettes, dispensers, and microplate washers. As the number one manufacturer of precision syringe pumps, TriContinent Scientific is a supplier to the world’s leading medical diagnostic equipment manufacturers.

For more information go to www.tricontinent.com
Trelleborg Sealing Solutions is a leading supplier of sealing systems for bicycle suspension to major cycle component manufacturers, including the Taiwanese shock absorber specialist A-Pro.

Pedal power

In short...

- Cylinders on the high-tech bicycles produced in Taiwan contain numerous advanced sealing systems
- Trelleborg Sealing Solutions supplies A-Pro Tech with sealing solutions for its high-end shock absorbers
- The collaboration began when seal leakage issues were solved
- The relationship continues due to Trelleborg Sealing Solutions engineering support, its understanding of the market and the products' cost-effectiveness
Background

In the West, people are taking to their bike in an attempt to get fit and be more environmentally-friendly. In the East though, pedal power has always been a major mode of transport. In the greater China area about 130 million cycles are produced each year, 70 percent of the world’s production. While China concentrates on the low-priced transportation-orientated models for its domestic market, Taiwan specializes in higher priced high-tech models for North America and Europe.

Not your grandmother’s bicycle

“Bicycles produced here are high technology machines,” says David Wang, Sales Manager of Trelleborg Sealing Solutions Taiwan. “From the outside it may not appear so, but the cylinders for a bike’s suspension contain numerous advanced sealing systems that keep hydraulic fluids in and external matter, like dirt and moisture, out.”

A key customer for Trelleborg Sealing Solutions is A-Pro Tech Co. Ltd., a company that specializes in high-end shock absorbers and whose X-Fusion brand is specified on leading makes of mountain and road racing bikes in the U.S. and Europe.

A perfect fit

“A-Pro recognized that we already had experience in supplying seals for sophisticated bicycle applications. They knew we had the right products and service to meet the company’s needs both technically and commercially. That’s why A-Pro first approached us,” continues David.

That was about 10 years ago, when A-Pro began experiencing problems with leakage from rear shock absorbers.

New sealing configurations

for A-Pro shock absorbers

feature Turcon® AQ-Seal®, our proprietary PTFE based sealing material and U-Cup in Zurcon®, our proprietary Polyurethane based sealing material.

Top-line performance

The sealing system has excellent overall sealing characteristics, a key element in the effective performance of A-Pro’s shock absorbers in difficult off-road and mountain terrain conditions. The specified configuration also ensures exclusion of external media, the ingress of which is a potential cause of failure, and most importantly meets zero leakage requirements.

About A-Pro Tech Co. Ltd

A-Pro was established in 1982, originally manufacturing parts for and assembling BMX bikes. From 1986 it began concentrating on mountain bikes and road racing frames. The company has several brands including X-Fusion, its high-end shock absorber range. It has manufacturing facilities in Tachia Town, Taiwan and in Kunshan and Shenzhen in China along with a sales office in Campbell, California in the U.S.

The X-Fusion brand is well respected in the cycling world. The popular O2 air shocks are specified on several major bicycle brands and have enjoyed widespread success in Europe. In 2009, the X-Fusion/Intense race team attacked the World Cup downhill circuit, testing and proving new products along the way.

“We helped solve this issue,” says David. “The existing seals were replaced with a complex configuration of specialized seals including a piston ring in Turcon®, our proprietary PTFE based sealing material and U-Cup in Zurcon®, our proprietary Polyurethane based sealing material.”

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“We found that other seal suppliers could not give the same level of engineering support to us,” says Andrew Huang, Vice President of A-Pro Tech Co. Ltd. “Trelleborg Sealing Solutions understands the bicycle market and can provide us with cost-effective sealing. The seals may be based on products supplied to other industries, but the systems are designed specifically to our requirements, meeting our needs exactly.”

New developments for even more demanding applications

Trelleborg Sealing Solutions Taiwan continues to work with A-Pro on new developments.

“Shock absorbers for heavier duty applications, such as in downhill and free-ride models, work at much higher pressures,” explains David. “For these we are developing new configurations featuring our Turcon® AQ Seal® which has proven to give exceptional performance in industrial applications that are also subject to high-pressure spikes. Sealing in bike suspension is on a much smaller scale but the principal remains the same. This is where our all-around technical expertise is a real advantage when combined with our specialized knowledge of bicycles.”

Tough seals for tough conditions

Trelleborg Sealing Solutions offers a broad range of sealing solutions for bicycles and is a leading supplier to the major cycle component manufacturers. Applications include the rear shock absorbers, front fork, seat post, brake lever, hydraulic disc brakes, hubs and pedals.

Explore our bicycle solutions on our website

www.tss.trelleborg.com/films

Find out more about X-Fusion bicycle and shocks at

www.x-fusion-shox.com
The automotive industry is continuously demanding more economical solutions from its suppliers. Some suppliers respond by just cutting prices but Trelleborg’s approach is very different. It looks for innovative solutions and this offers its customers better value, especially in high-tech components.

Automotive electronics sector is growing

An important area of focus for Trelleborg Sealing Solutions is the growing automotive electronics sector. In 2004 the majority of controls on cars were mechanical, with less than 20 percent being electronic. By 2015, this is expected to shift to a 40 percent electronic and 60 percent mechanical split.

“A secure seal on an electronic control unit or ECU is vital,” says Marco Holst, Automotive Engineering Manager at Trelleborg Sealing Solutions in Stuttgart, Germany. “Failure can be a major safety issue, so the seal must be guaranteed to keep out moisture and any external media which may interfere with the electronic unit.”
ECUs are complex in design and difficult to seal

Most of the time the room available within the engine compartment or interior is extremely limited, so ECUs are sometimes of a complex design. For harsh environments such as in gear boxes, the ECUs’ covers are usually made of metal. The conventional method of sealing them is with a molded gasket, manually press fitted into a groove. However, based on experience, Trelleborg Sealing Solutions engineers knew that good sealing integrity could be achieved with a rubber bonded to metal seal. The technology behind this though is not simple.

When looking for potential rubber to metal bonding expertise, an obvious choice lay within the Trelleborg group. Trelleborg Rubore, part of Trelleborg Automotive is a world leader in the production and development of brake noise and vibration damping solutions. It specializes in innovative rubber to metal sandwich composite materials.

Designs can meet customers’ needs

“We began working with Trelleborg Sealing Solutions on the ECU sealing project back in 2007,” says Carsten Menzel, Manager for LAM Products in Rubore’s facility in Mettmann, Germany. “It was a challenging application that led us to investigate new processes. We felt we could not only seal the component but in addition provide damping characteristics, bringing the three core competencies of Trelleborg – sealing, damping and protecting – together in one solution.”

“The single integrated laserSEAL unit incorporating the unique material from Rubore makes it possible to design sealing geometry to meet the customers’ needs,” continues Marco. “Not only is the sealing function superior but the integration of the two parts also contributes to total cost saving benefits. For the customer there is only one part number, one logistics process, one packaging operation and one less, often manual, mounting operation during assembly.”
Handling a traditional elastomer gasket is a bit like handling spaghetti. It is not possible to automate the process of fitting the gasket into the groove of an ECU to seal it. Instead it requires a skilled and costly manual operation. Probably the most important benefit of the new laserSeal unit technology is that process step is no longer necessary. As the seal and housing cover are a single integrated unit, then the fixing of the cover to the ECU can be totally automated.

Getting automated

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Aero engines are a hot topic

In short...

- Paul Jones, Global Segment Manager Aero Engines, gives his views on the trends and opportunities in the aero engine market
- Product development is continually driven by new platform development with the biggest focus on reduction in fuel consumption
- New technologies will soon be incorporated in planned aircraft models
- These technologies are making sealing more challenging and Trelleborg Sealing Solutions are responding with new and enhanced products
Paul Jones has been involved in aerospace engineering for the last 12 years, and for the past 18 months, he’s been responsible for putting together the Trelleborg Sealing Solutions global strategy for business development of aero engine sealing systems. Here he gives his views on the trends and opportunities in this challenging market.

“Last year the number of aircraft manufactured remained steady,” says Paul Jones, Global Segment Manager Aero Engines. “Build schedules were already set based on past orders, so the fact that order intake was badly hit in 2009 had little effect on production. The exception was the business jet sector, which went down by a massive 33 percent.”

**Investment continues in the aerospace industry**

Despite the difficult economy, prospects in the aerospace industry look good and real growth in the civil market is expected in 2012.

“While other industries may have backed off on new product development, aircraft manufacturers have continued their innovations. It’s been quite exciting recently. We saw the first flights of the 787, A400M and Gulf Stream 650. The A350 is under development, and we are expecting the engine for this to be flown in 2011, not on the model itself but bolted onto an A380 flying test bed.”

**Reduction of fuel consumption a main driver**

When asked what has been driving new platform development, Paul says the biggest focus is on reduction of fuel consumption.

“Everyone is looking at greening their fleets. For every ton of fuel burnt, three tons of CO₂ are produced. So obviously the less fuel burnt, the less CO₂. However, the emission of carbon dioxide is not regulated, and up until now what has really motivated aircraft operators to reduce consumption is the need for profitability. The lowering of fuel burn therefore has double drivers: a green one and a monetary one.

“So we are seeing great emphasis being placed on developments to meet this objective. Composites are coming to the forefront as a means of making planes lighter. And on the engine side we’re seeing a move from traditional design to advanced turbo fan models and eventually to integrated propulsion systems. The advanced turbo fan models can give around 15 percent better performance.”

**New engine designs bring greater efficiency**

According to Paul, while integrated propulsion designs are still on the drawing board, advanced turbo technology will be available in the near term and is being considered for upgraded and redesigned single aisle planes. The Bombardier C-Series fitted with the advanced turbo engine is expected to be in service in 2013.

“Single aisle planes such as Boeing’s 737 and the Airbus A320 are by far the most popular aircraft. The 737 had its first flight in 1967 and the A320, 20 years later, so they are considered aging platforms. There’s only so much that can be done to improve fuel economy before a new start in aircraft design is required. Modifying the engine and light-weighting the wing of the existing planes may bring savings of around 20 percent. But the next generation aircraft could see an improved performance of 30 or 40 percent.”
Hotter engines make sealing more challenging

The latest engine technologies present greater challenges for seal and airframe suppliers.

“The new engine designs push at the limits of material technology to achieve the maximum efficiency gains and reduce maintenance requirements,” says Paul. “Seals therefore have to be stable at extreme temperatures. To cope with these we’ve developed special Isolast® perfluoroelastomers that can operate up to +325°C/ +617°F. Lubricants are also an issue. For these hotter engines High Thermal Stability (HTS) oils are used. These are aggressive and can degrade seal materials. We have developed and tested high-temperature sealing materials for these lubricants. Fluorocarbons with enhanced chemical resistance can operate in temperatures from -40°C/ -40°F up to +200°C/ +392°F.”

Optimized sealing materials for synthetic fuels and biofuels

Environmental pressure to reduce consumption of fossil fuels has led the aircraft industry to look to synthetic fuels and biofuels. Extensive testing of sealing materials has also been undertaken in these.

“Airlines are serious about investing in alternative fuels,” continues Paul. “This is shown by the announcement from British Airways that it’s struck a deal to build the first plant in Europe to produce jet fuel from waste matter.
“Synthetic fuels and biofuels are potentially difficult media to operate in for seals. These fuels are characterized by their lack of aromatic hydrocarbons, and if a sealing material is wrongly specified, degradation can occur, causing shrinkage and potential leakage. We’ve tested a selection of our materials with Synthetic Paraffinic Kerosene (Bio-SPK) and variants so we can recommend the optimum performers to our customers.”

Making the best of what we do well globally

In terms of the strategy, Paul says that Trelleborg’s pedigree in aero engines is not only its biggest opportunity, but also its greatest challenge.

“Trelleborg has been supplying the aerospace industry for over 50 years. A natural consequence of how we have grown through acquisition is that different parts of our business are stronger in one region than another, or with a particular customer. Though we may have leading positions in the supply of aero engine components, we have never really consolidated these.

“For instance, we are strong through our Northborough, U.S. facility in fire seals in the U.S., through Cadley, England on nacelle air frames in Europe and through Condé, France, we are a leader in O-Rings, again primarily in Europe. Also, in Tewkesbury, England, we specialize in the development of Isolast® sealing materials for aerospace applications.

“We will capitalize on these leading positions to enable us to provide a complete product offering to our customers. This will expand our sales and make Trelleborg a more attractive partner. Our strategy is to make the best of what we do well globally.”

A broad range and global reach are advantageous

The breadth of Trelleborg Sealing Solutions range for aero engines meets another growing trend within the industry, as customers move towards supply chain reduction.

“We are in a prime position, as engine manufacturers look to lessen the number of suppliers they have. Trelleborg Sealing Solutions is respected within the industry, and there is no other supplier who can offer the breadth of range we can.

“Our global reach is also proving an advantage. The move to Asia Pacific has been less rapid than in other industries, and aerospace is still primarily centered in the U.S. and Europe. There are some joint ventures and partnerships, but Rolls Royce is the first engine builder to have its own Asian facility in Singapore. We have existing manufacturing sites throughout Asia and expect that our existing relationships will make us a first choice for supply. This is also the case as U.S. manufacturers move into Mexico and the Western European ones into Eastern Europe.”

Future aircraft will look totally different

Asked about how aircraft engine technology will develop in the future, Paul says that future planes could look totally different from now.

“The buzz around the industry is about completely integrated propulsion systems. This manages the aircraft’s energy demands while minimizing the weight and drag of engine-related components. It involves matching the engine to the airframe and systems. There will be an increase in the use of electric actuation rather than hydraulic or pneumatic; engineers are moving toward weight-savings through increased composites and better harmonization of the wing, pylon, nacelle and engine combination.

“The concept designs for planes with this technology appear very odd. They have a primarily composite body with forward swept thin wings and unducted fan engines at the rear. Whether these ideas will become reality, we do not know. What I am sure of, though, is that Trelleborg seals will be specified on aero engines in the future, whatever they may look like.”
Seals and airframe components from Trelleborg Sealing Solutions are used throughout the aero engine. Airframe components are featured in the nacelle, the visible part of the engine, which consists of the inlet cowl, fan cowl and thrust reverser. As well as these, we supply annulus filler seals that bridge the gap between two adjacent blades in the main fan and the fire-resistant ducting that surrounds the engine.

Less visible are the seals that Trelleborg Sealing Solutions provides for the internal workings of the engine. Seals such as O-Rings, Wills Rings®, Turcon® Variseal® and Turcon® Varilip® PDR are in the internal gearboxes and associated bearing chambers, oil and fuel systems including the pumps, metering units and filters. In addition, we provide clamp blocks and glass braided shielding to hold pipes, ducting and wires in place.
Aero engine product range from Trelleborg Sealing Solutions

**Engine equipment**
Throughout the engine, seals from Trelleborg Sealing Solutions perform in elevated temperatures, aggressive media and high pressures. These range from O-Rings and gaskets used in static applications in fuel metering units, filters and connectors to dynamic seals such as Turcon® CX Seals, Turcon® VL Seal®, Turcon® Variseal® used in linear actuators and valves and Turcon® Varilip® PDR used in rotary applications.

**O-Rings and gaskets**
Used for static sealing in various parts of the aero engine including the gearbox, air, oil and fuel systems. O-Rings and specially molded gaskets are available in media and temperature optimized sealing materials. These include Fluorocarbon (FKM) as well as the Trelleborg Sealing Solutions proprietary Perfluoroelastomer (FFKM) Isolast®, which has superior thermal stability at extremes and is resistant to virtually all media.

**Turcon® Variseal®**
For static and dynamic applications in the aero engine, Turcon® Variseal™ is selected for applications where elevated temperatures, high pressure and potential contamination create an extremely demanding environment for sealing elements. Turcon®, the Trelleborg Sealing Solutions proprietary PTFE based sealing material, is resistant to virtually all media and can operate in temperatures up to +260°C/+500°F.

**Turcon® Varilip® PDR**
Ideal for dynamic applications within the aero engine, Turcon® Varilip® PDR rotary shaft seals are constructed from a precision manufactured metal body and a mechanically retained Turcon® sealing element. They offer improved media resistance and operating temperature range over seals with pressed cases that require a gasket. Turcon® Varilip® PDR has low friction and stick-slip-free running, reducing temperature generation and permitting higher peripheral speeds.

**Fire seals**
Used throughout the aero engine in ducting, fire seals are the ultimate in safety-critical sealing components. Manufactured from proprietary polymers and fabrics, they are compliant with international standards ISO2685 and AC20-135. To meet the requirements of these standards they are capable of withstanding a +1,100°C/+2,012°F flame for 15 minutes.

**Nacelle seals**
The nacelle allows the smooth flow of air into the engine, reducing noise, and in the event of blade failure it protects the aircraft from debris. Trelleborg Sealing Solutions provides fire seals in the fire wall of the thruster reverser, vital for safe landings. There are also aerodynamic seals on the translating sleeve and blocker doors and custom-designed components such as pressure-relief doors and hinge covers.

**Pipe clamps**
Produced from fire-resistant materials, Silicone or Fluorosilicone, pipe clamps are molded blocks that hold pipes, ducting and wires in place within the aero engine. Appearing to be simple, they do a vital safety-critical job, ensuring pipes, ducting and wires are not damaged or disconnected by the high vibrations within the engine.

**Annulus filler seals**
Specialized airframe seals, precision-fabricated annulus filler seals are manufactured from advanced materials developed to withstand their difficult environment. Designed to bridge the gap between two adjacent blades in the main fan, the seals smooth air flow and improve engine efficiency.

**Glass braided shielding**
Used around steel clips on fuel line pipes, glass braided shielding is made from filament glass yarn impregnated with PTFE. It is resistant to a wide range of media and unaffected by lubricants, hydraulic fluids, fuels and atmospheric conditions. In addition it withstands abrasion, shearing and mechanical damage.

**Wills Rings®**
The original metal seals, Wills Rings® are engineered for use in demanding situations where the capabilities of polymeric seals are exceeded. Operating in temperatures from cryogenic up to +850°C/+1,562°F, they withstand pressures from hard vacuum up to 1,000 MPa / 145,038 psi. These seals can be specified close to the combustion and exhaust section of the engine where the conditions are extreme.
Sea timber
Proven alternatives to steel, wood or concrete in structural applications.

Quick release hooks
Quick release hooks are the basis of any advanced integrated mooring system.

High performance fenders
Rugged fenders that come in a range of compounds to suit various applications.

Marine protection plates
Resilient bumpers mainly designed for quays where small vessels are moored.

Roller fenders
Roller Fenders are usually installed to guide ships in restricted spaces.

Pneumatic fenders
Ideal for permanent, semi-permanent port applications and for offshore ship-to-ship transfers.

Tug & workboat fenders
Tug fenders must work hard and long and under extreme conditions.

Safety ladders
Flexible and corrosion resistant, they can withstand accidental impacts from smaller vessels.

Bollards
Pillar, kidney, horn and tee head bollards suit most jetties.

Pneumatic fenders
Ideal for permanent, semi-permanent port applications and for offshore ship-to-ship transfers.

Hoses
Media resistant hoses feature in various ship’s equipment.

Sea timber
Proven alternatives to steel, wood or concrete in structural applications.
“More than 90 percent of all commodities are transported by sea.”

A safe harbor

Since time began, a harbor has been a place where ships can shelter. Today Trelleborg solutions are key to making them even safer.

Harbors and ports, whether large or small, man-made or natural, play a vital role in world trade. More than 90 percent of all commodities are transported by sea, so harbors have been key to economic activity since man first set sail.

Docking a boat in a busy seaway can be hazardous, and Trelleborg is a leading provider of safety solutions. High-tech mooring systems incorporate electronically controlled quick-release hooks and load-monitoring technology to help ships dock safely. Buoys and fenders made with advanced polymers absorb and withstand the severe impacts generated in docking.

On the jetty itself, unique composite plastics with improved ability to withstand damage replace their wooden counterparts, and tires are used to open and close loading areas. Beneath the waves, Trelleborg diving suits provide divers with the highest safety standards.

In addition, Trelleborg supplies numerous components for the ships themselves. High-performance anti-vibration systems contribute to a smooth ride for passengers, while Orkot®, a composite bearing material resistant to seawater, allows rudders to operate efficiently. Numerous seals and hoses are also used in boats’ engines.
Seals are used in an infinite number of applications in all industries. These range from elastomer O-Rings in cars, to the sealing systems within cylinders in off-highway equipment, from the seals in wind turbine controls to safety-critical components within medical devices.

Complex sealing configurations can feature a large number sealing elements. Trying to illustrate these on a 2D page is difficult and can never properly show their function or characteristics. Trelleborg Sealing Solutions therefore turned to the latest graphic technologies to produce 3D animations of applications and typical sealing solutions for them.

“Originally our films and animations were seen by customers in exhibitions or presentations,” says Robert Zahiri, Manager Global Marketing and Communications. “Our customers have always been impressed by them, so we have decided to make this media easily available online.”

A few of our favorite films...

Oil & Gas

Seals from Trelleborg Sealing Solutions provide proven performance in a wide variety of systems used in exploration, completion, production and refining activities. Our materials and products can be fitted on anything from downhole drilling motors to oil platform tensioner systems, from subsea valves to refinery separation equipment.

Mobile Hydraulics

In this film about sealing in off-highway applications, a sealing configuration for a bucket cylinder is shown in detail. Other off-highway applications featured include lift cylinders, arm cylinders, chain drives, steering cylinders and wheel hubs.
Trelleborg Sealing Solutions has provided parts for wind turbines since the technology began. We are now the leading seal supplier to the market. Seals from Trelleborg Sealing Solutions provide low friction, long life, zero leakage and easy installation, meeting the key requirement of maximized meantime between maintenance.

A wide variety of hydraulic seals are supplied for injection molding machines. This film shows an application example in a short stroke clamp cylinder. Our solutions are also featured in the lock cylinder, ejector cylinder, mold stroke cylinder and rotating injection unit.
The largest World Expo ever is taking place in Shanghai, China from May through to October this year. The theme of the Expo is Better City, Better Life. 17 million visitors are expected to visit the exhibitions of the 239 countries and international organizations in attendance.

Trelleborg is one of the official partners in the 3,000 square meter/ 32,290 square foot Swedish pavilion, the theme of which is The Spirit of Innovation including sustainability, communication and innovation.

“We see the World Expo as a big opportunity for us to increase the awareness of Trelleborg among our Chinese stakeholders as a global engineering group creating innovative solutions that seal, damp and protect in demanding environments,” says Gunilla Annehed, who is organizing the presence of Trelleborg Group. “Our participation reflects our focus on China. We feel it is going to support our Chinese facilities, bring us closer to customers and aid recruitment.”

During June and July Trelleborg will be holding special events in the VIP area including a customer day and special days for Trelleborg employees.

Low-carbon, high-tech

Lots of new and high technologies are being applied to the Shanghai World Expo. Clean energy will be used to power the six month event. The 5.8 square kilometer exposition site will be the largest scale solar energy application with 4.6 megawatt generators. Electricity will also be produced by a bank of 34 three megawatt wind turbines. The target is to have zero-emissions from vehicles used on the expo site with various kinds of electrically driven cars used as transport.
Some call it a deep challenge. We call it Trelleborg.

Deep-sea drilling. Hundreds of miles out to sea, huge drilling rigs are hard at work finding oil. In this extremely tough environment, specially developed buoyancy modules from Trelleborg protect the rig by reducing the weight of the long and heavy steel drilling pipe.
All inclusive.

You can now sit back and relax. Let us take care of the rest.
At Trelleborg Sealing Solutions you will find everything from application engineering to seal design, from production to getting seals to you just in time, is part of our service.
Get in touch with your local marketing company to get the all inclusive treatment.