

simrit® insight.

No 1 | 2009

The magazine for Simrit customers

Simrit and Honda

Synergy in Brazil



Materials

Nano technology improves seal performance



Materials

FKM for harsh environments



Applications

Multi-purpose kitchen aid



Innovations

FEA for O-ring form, fit, and function

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Freudenberg and NOK Group



David R. Monaco
Simrit Americas

Dear Readers,

In today's economy, having stable and trustworthy suppliers is more important to your success than ever. Reliable partners help you achieve your goals of top of the line product performance and complete customer satisfaction. Simrit, as your technology specialist, offers a diverse range of technologies and can give you advice regarding your application issues right from the start. Ground floor project involvement has led to many innovations around the world, as illustrated in the following articles.

This issue of Simrit Insight focuses on technological advancements our materials experts have been working on, from nano technology for improved seal performance to new FKM compounds for truly harsh environments. The articles highlight various applications that require innovative seal design and creative problem solving at both the customer and supplier levels.

I hope these articles will give you plenty of new ideas for your own developments and that they will lead to productive discussions with your dedicated Simrit engineers and sales team. As always, you can count on us to be your sealing partner through these challenging economic times.

Yours sincerely,

David R. Monaco
Simrit Americas

Tillsonburg, Ontario, facility now UTC Supplier Gold

Simrit's Tillsonburg, ON, Canada site has recently been awarded UTC's (United Technologies) Supplier Gold Status. Our site is one of the first UTC suppliers to be approved to Supplier

Gold. UTC awards this title to companies that are "best-in-class" in delivery, quality, customer support, and lean practices.



TechDay at MWM International

On February 17th, Simrit hosted a TechDay at MWM International's site in São Paulo, Brazil. The training topic was Valve Stem Seals, an important product for the Brazilian market. Ademir Oliveira Antunes was the Simrit engineer who gave the training, which was attended by over 40 participants. Simrit focused on the qualities and benefits of valve stem seals and on their applications, explaining in detail the advantages of this product. Discussions focusing on how Simrit's technology could help the company in the development of future projects were led by MWM's group on projects relating to sealing.

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Update your information on Simrit products and technology with these new brochures and flyers from our website:

- Thermoplastics Seals and Components flyer
- Metal OD Radial Shaft Seals brochure
- O-Ring Quality Assurance Standards brochure
- Semiconductor Sealing Applications Technology brochure
- 6 new diaphragm product flyers
- RFN™ Treatment flyer
- Simrit UL Listed Compounds flyer
- Diaphragm Design Manual

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Imprint

Simrit® insight is the magazine for Simrit customers. **Publisher:** Freudenberg-NOK General Partnership, 47690 East Anchor Court, Plymouth, Michigan 48170-2455 **Responsible:** Tim Lomax **Phone:** 734-354-5336 **E-Mail:** tim.lomax@simrit.us **Project Management:** Katharina Bergman **Phone:** 734-354-5586 **E-mail:** katharina.bergman@simrit.us **Internet:** www.simrit.com **Editorial & Design:** Frank Trurnit & Partner Verlag GmbH and Leidental Design. Reprinting or reproduction only with approval of the publisher.

SIMRIT and HONDA: Maximum Synergy in Quality and Technology

A sales leader in the two-wheel segment, Honda was one of the first companies to import and manufacture motorcycles in Brazil. It began operating in the country in 1971 and, five years later, it was producing locally. Today, Honda offers 14 motorcycle models in the Brazilian domestic market and exports to over 70 countries. Since 1997, it has been producing automobiles too.

High technology in the heart of the Amazon rainforest

Honda's motorcycle plant is located in the heart of the Amazon rainforest, in the city of Manaus, capital of the largest Brazilian state—Amazonas—with over 1.5 million square meters in area. Manaus sits on the Negro River, the main affluent of the Amazon River, and enjoyed a major development period between 1900 and 1920 as the major rubber producing center of the world's automobile industry. Presently, Manaus houses one of the largest industrial parks of Latin America, with over 400 companies operating in the Manaus Free Zone, a free-trade import and export area with special tax incentives. The main Brazilian electronic industries are also concentrated in this region. Continuous investment in technology is Honda's main differentiator to maintain

its leadership in the Brazilian two-wheel market. Its industrial park in Manaus has a complete product development structure and is certified according to the world's major quality and environmental standards, such as ISO 9002 and ISO 14001. The plant employs 9,500 people, produces around 6,000 units/day and, in 2008, reached the historical mark of 12 million motorcycles manufactured since operations began.

A big hit in small displacement

In 2008, more than 1.45 million Honda motorcycles were sold in Brazil, with the CG 150i Titan standing out. A sales leader for over 30 years now, the CG 150i Titan motorcycle reached the mark of 462 thousand units sold. Small displacement motorcycles (up to 150 cc) are a sales hit in the country.



They are sold at an average price of US\$2,800 or, in monthly installments of around US\$47. Strong, economic, and easy to maintain, they hold an 85% share of the Brazilian two-wheel fleet. They are ideal for the busy traffic of large urban centers and serve as a practical and inexpensive alternative to horses in rural zones. In addition to the CG 150i Titan, other top-selling Honda 100 to 150 cc motorcycles in Brazil include the BIZ 125, CG 125 Fan, CG 150 JOB, CG 150 Sport, and Pop 100.

In 2008, the Honda motorcycle plant employing 9,500 people in Manaus, Brazil, reached the production milestone of 12 million units.



The ideal sealing for Honda quality

Since Honda began manufacturing motorcycles in Brazil in 1976, it has been important to source components from the best parts manufacturers in the country. For that reason, in the very first years of activities Honda established a partnership with Rubrasil, an automobile sealing products manufacturer, that was incorporated into the Freudenberg group and has evolved to become Simrit today. Today, Simrit oil seals and O-rings help Honda motorcycles win maximum consumer reliability. These parts are critical to the perfect operation and durability of motorcycles, preventing fluid leakage into the environment and reducing pollutant emissions. Simrit supplies 16 sealing items to the Honda motorcycles produced in Brazil—15 oil seals and one O-ring. Simrit products seal the engine, clutch, gear-

box, and wheels. The high technology of the items supplied, together with the fulfillment of delivery deadlines and efficient post-sale services, resulted in approximately 5 million oil seals and 50 million O-rings being provided to Honda last year. The two top-selling motorcycles of the Brazilian market—Honda CG 150i Titan and Honda CG 125 Fan—rely on the quality of the Simrit oil seals for perfect sealing of the starter pedal, clutch shaft, gearbox shaft, driveshaft, starter motor, front brake panel, and rear hub cap. For over three decades now, the Simrit and Honda partnership has been strengthened by the similarities between the two companies—the priority of continuous investment in new technologies, maximum product quality/performance/safety, and full customer satisfaction as their ultimate goal.

In brief



- Honda's Brazilian operation and Simrit have been partners for about 30 years. Simrit presently supplies 16 products (oil seals and O-rings included) for Honda's motorcycles.
- Such a long-lasting partnership is made possible by shared values: investment in new

technologies, commitment to maximum quality, and full customer satisfaction.

- In 2008 Simrit supplied approximately five million oil seals and 50 million O-rings for the Honda motorcycles produced in Brazil.



For questions please contact Adriano.Vargas@simrit.com.br

Simrit's spring-energized seals are integral to Honda's motorcycle production in Brazil.



Expertise on the Flender test bench

The Mechanical Drives business unit of Siemens AG is the leading provider for mechanical drive technology world-wide. Under the Flender brand, the business unit offers industrial gears and couplings for nearly all industrial applications. Siemens Mechanical Drives has been working with Simrit for quite some time for their lubricant selections.

The operating reliability of gearboxes is not only the result of the dependability of the rotary shaft seals that are used. For the approval of lubricants in Flender gearboxes, the compatibility of the seals with the lubricants is crucial. To this end, both companies have worked together on projects to develop a comprehensive testing program known as the Flender Test. Against the backdrop of increasing life-cycle requirements for the entire system, this test scenario has now been revised with the goal of achieving a considerable improvement in the dependability of the test results. With the introduction of the Flender Test, the compatibility between the lubricant and the radial shaft seal has been greatly improved. The method has also proved a pioneer for new gearbox lubricant

formulas. Siemens Mechanical Drives guarantees that a significant improvement in the operating reliability of the gearbox will be realized. The specifications of the enhanced Flender Test go beyond both the requirements of the static tests in accordance with DIN ISO 1817 as well as requirements of the dynamic oil compatibility test based on DIN 3761.

Combined expertise

Over the course of an optimization process lasting about a year, Simrit and the Siemens business unit worked to further develop the current test specifications on a fundamental level. As a result, it was possible to significantly improve the correlation between the test results and the real life-cycle values of



Flender gearboxes—
greased with Simrit's expertise

the radial shaft seals. Simrit's expertise in compatibility of sealing elements with lubricants and Siemens' expertise in gearboxes were combined in the Flender Test. Both companies were able to improve the dependability of sealing systems. An additional step toward increased environmental compatibility was also made by incorporating lubricants from renewable resources into the test series.



In brief

- The compatibility of lubricants with radial shaft seals is ensured via the Flender Test
- Project work between Siemens Mechanical Drives and Simrit offers technical and economic benefits



Do you have any questions or suggestions? Please contact Martin.Mueller@simrit.de



Aircraft safety is tops with Simrit compound N459

Simrit compound N459 meets all AMS-P-5510 requirements and bests the competition. N459 material shows excellent balance of performance properties for aircraft hydraulic systems

With the safety and sustainability of air travel at risk if the quality and integrity of the sealing solutions are in question, many critical aerospace applications are dependent on the technology that seals them.

Simrit has long been committed to providing the best in sealing solutions to the aerospace industry. This was recently reinforced when the company's N459 compound received Qualified Product Listed (QPL) status on AMS-P-5510-certified seals for aircraft hydraulic systems. Additionally, in a recent test performed by Simrit engineers, the N459 O-ring met all of the requirements of the specification. In contrast, two competitive seals failed in several areas, including two crucial areas of performance—compression set resistance in the application fluid and low-temperature flexibility as measured by TR-10.

"We're clearly pleased with the results," said Dr. Bob Keller, materials development manager for Simrit. "Both of the competitive seals tested were qualified product listed on AMS-P-5510 and yet they did poorly in key performance

areas. We are proud of our products and confident in our ability to provide customers with the best seals and materials in the aerospace industry." The competitive testing examined the materials based on: original properties (hardness, 50 percent modulus, tensile strength, ultimate elongation and specific gravity); heat aging (change in hardness, change in tensile strength and change in ultimate elongation); immersion in liquid (change in hardness, tensile strength, ultimate elongation, change in volume, TR-10); compression set; and cold temperature resistance. Simrit's N459 O-ring outperformed its competition in nearly all tested properties. N459 was created with low-temperature flexibility to prevent leakage in sub-zero temperatures and at altitude. The elastomer material offers better resistance to high pressure and excellent resistance to red hydraulic fluids used in actuation systems. And unlike other products made to the AMS-P-5510 specification, Simrit's N459 doesn't corrode the mating metal fittings and components, and doesn't bloom or discolor.

Simrit's N459 material, as well as several other innovative sealing technologies and products, will be on display at Paris Airshow Le Bourget's 100th anniversary in France from June 15 to 21, 2009. Visit Simrit at our booth in Hall 3, Stand B11.

In brief

- Simrit's N459 compound received Qualified Product Listed (QPL) status on AMS-P-5510-certified seals for aircraft hydraulic systems.
- N459 O-ring outperformed its competition in nearly all tested properties



Do you have any questions? Please contact Robert.Keller@simrit.us

Partnership in technology

When developing dependable drive technologies, reliable partners are of utmost importance. In the case of German drive specialist Wittenstein, Simrit was involved early on in the reworking of the SP and TP drive series. A new wear-resistant elastomer has helped to improve service life.

For companies like gearbox and drive specialist Wittenstein AG, who supply systems to nearly all branches of mechanical engineering, aviation and aerospace, the first priority is technological reliability. Wittenstein expects partners for whom dependable technologies are also a top priority and who can be integrated very early into development projects thanks to equal quality standards. "This ensures that high-quality products are developed to offer a maximum benefit to the customer," explains Walter Lang, Head of Development for Drive Components at the Central Development department of Wittenstein AG.

Early incorporation into projects

As a specialist in sealing technology, Simrit was involved in the reworking of the SP and TP gearboxes from Wittenstein, beginning as early on as the initial design considerations. The goal of the project was to increase service life and reduce the running noise in gearboxes. Simrit also made suggestions early on to optimize the surface treatment of the



Technical dependability is integral to gearboxes from Alpha Wittenstein.

shafts and made a case for the use of a radial shaft seal made of the new wear-resistant 75 FKM 170055 elastomer. As a result, the wear rates and warm-up times of the sealing system were considerably improved. In specific terms, the new elastomer was 30 percent better than the industry standard. Use of the new material yielded considerably longer service lives for gearboxes, fewer defects and less downtime.

Less downtime

The new benefits not only strengthen the reputation of Wittenstein and its customers in a variety of industries, they also provide customers with tangible financial benefits. The systems now require maintenance less often. The low failure rates and downtimes improve the overall utilization ratio of the systems. "Thanks to the competent advice provided by Simrit, it was not only possible to improve the dependability of our products even more; now we can also include dependability

forecasts for seal technology used in our products," says Volker Metzger, Head of Customer Service at Wittenstein AG. The open, constructive project work not only allowed for the achievement of project goals described here, in addition, a shared knowledge base was also established for future projects.



Gearbox series SP—Simrit collaboration was integrated early on beginning with the initial constructional considerations.



Container ship travel is a time-dependent business, where downtimes can be very expensive.

Cool O-rings in hot environments

The sealing of turbochargers demands materials that can withstand high temperatures without being damaged. Simrit now supplies ABB Turbo Systems with 20 different types of O-rings made of temperature-resistant FKM.

Exhaust gasses are waste products?

On the contrary! This resource simply has to be utilized. For example, exhaust from diesel or gasoline engines contains power that can, when used intelligently, unleash the true potential of these engines. Headquartered in the Swiss city of Baden, ABB Turbo Systems has been improving the performance of diesel and gasoline engines through its turbocharger technology for more than eight decades. The product range of the corporate division of ABB includes the right supercharger for each 2-cycle and 4-cycle engine. And these superchargers are tailored to achieve efficient operation in the 500 kW to 25,000 kW power range. The exhaust of the engine is used by a turbine to drive a compressor which compresses air into the cylinder compartments, thus increasing the power of the engine. This principle allows the engine power to be increased by a factor of four as a result of supercharging—nearly 75 percent of the total power of an engine. The turbocharger is thus a central power element of an engine and is absolutely indispensable. If, for example, a container ship were to pull into port several days late due to a failed turbocharger, this could cost the shipping company a great deal of money. This failure could be caused by inconspicuous

and cheaper components. If these are of inferior quality, the turbocharger can fail, resulting in higher costs. ABB Turbo Systems is therefore pleased with its partnership with Simrit which goes back more than ten years. Customers have had positive experiences with Simrit's FKM seal elements used for high temperature ranges. The O-rings made of high temperature-resistant elastomer 75 FKM 171978 are guaranteed to be oil-proof on both the exhaust side—even at a temperature of 250°C—as well as for the compressor air at 200°C.

Longer service intervals

Business with the high temperature resistant FKM mentioned above began

in 2004 with three different sizes of O-rings. Today, there are 20 different sizes. Because the installation situation does not permit any changes during operation, the O-rings must be adapted to the particular conditions present. Despite the ever increasing demands that result from increasing temperatures, it was possible to considerably increase the service intervals of the O-rings. Shippers, for example, can be sure that even after turbochargers have been operated for extended periods their containers will be delivered on time.



A compressor plate with seal ring from Simrit.

In brief

- Collaboration between Wittenstein and Simrit in the reworking of two different gearbox series
- All competencies (lubricants and seals) were supplied from a single source
- Based on the excellent qualities of the radial shaft seals, Wittenstein products can be used for a broad range of applications

Any questions or suggestions? Please contact Andreas.Franke@simrit.de

In brief

- ABB turbochargers increase the power of a diesel or gasoline engine by a factor of four
- Turbochargers are used in all types of ships, in mining vehicles, diesel locomotives and power plants using diesel or gasoline engines
- Simrit provides custom high temperature resistant FKM O-rings for ABB turbochargers

Any questions or suggestions? Please contact Anton Schneider: as@simrit.ch

Nano technology yields large improvements

RFN (Reduced Friction by Nanotechnology) is an innovative process to improve seal function and service life. Simrit now has more than eight years experience with these new treatment processes.

High on the list of customer requirements are parameters such as “long service life,” “extended maintenance intervals,” and “low coefficients of friction.” Achieving these goals requires continuously adapting and modifying sealing components in various ways. One of the newest technologies available for improving sealing performance is surface transformation through RFN treatments.

The challenge of seal surfaces

Sealing components made of elastomeric materials can inherently have high surface energies (tackiness) and a high coefficient of friction (COF). Whenever an elastomeric seal makes contact with the mating component, the interface of the two surfaces can produce a “stiction” effect. This can be detrimental when the contact is intermittent. Here is where Reduced Friction by Nanotechnology (RFN) becomes a factor for improving seal performance. Applications that require low “stiction” and long service life such as valve sealing components and diaphragms can greatly benefit

from RFN treatments. Sealing component surfaces modified with RFN treatments demonstrate high abrasion resistance, low COF, resistance to aggressive fluids and improved long-term service. Many applications where release performance, load, and torque reduction are required can benefit from the RFN process.

Working with RFN

The RFN process consists of applying a proprietary surface modification to

rubber components to reduce the COF. After rubber sealing components are placed into the RFN equipment, necessary media are introduced and the process is turned on. A subsequent surface modification takes place within the equipment and results in a permanent surface change. All process input variables are automatically controlled. Process output control comprises both visual inspection and COF testing on each process lot. Simrit has over eight

years of experience with the RFN process for various applications including semiconductor seals, solenoid plunger valves, and fuel caps seals.

Resistant to cleaning media

In addition to a reduction in the coefficients of friction, the resistance to the CIP/SIP media commonly used to clean the systems is considerably improved through modification of the part surface by RFN. This increases the life of parts and reduces maintenance costs and downtime. The optimal function of the treatment is enhanced through suitable selection of the treatment system and precise coordination of the application process. Simrit can carry out both solid-film lubricant and RFN treatments for customized applications.

Features of RFN treatments

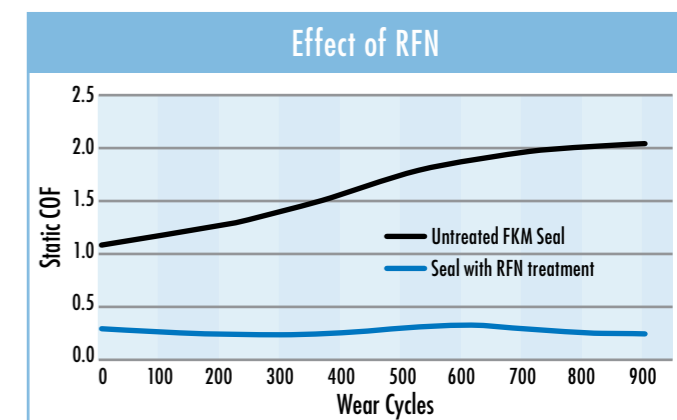
- Comparative testing of untreated and treated specimens has consistently shown a 70% reduction in static COF.
- The RFN treatment is inert and compatible in applications that require purity. The resulting RFN treatment is odorless and translucent in color.
- Long-term conditioning in fuel, ozone, and wear testing has consistently resulted in no increase of surface COF, while untreated specimens exhibit 80–100% increase in COF.

Benefits of RFN treatments

- Sealing performance is maintained with no compromise to the physical properties of the elastomer.
- Low coefficient of friction that results in improved performance

- Lower torque and loading—valve seals, cap seals, and applications with intermittent loading
- Longer service life potential—highly abrasion-resistant surfaces
- Aggressive media resistance—COF remains constant with increased holding time whereas untreated materials deteriorate with increased holding time.
- Adhesion to the elastomer and the ability to flex is maintained without micro cracking even with high forces and at -40°C.
- Simrit works in collaboration with our customers to develop RFN treatments best suited to their applications.

Water droplets on this lotus leaf demonstrate nano surface properties found in nature.



Test Condition	Untreated FKM	RFN Treated
Baseline	1.09	0.30
Fuel C, 168 Hrs	1.11	0.21
Fuel CM20, 168 Hrs	1.43	0.27
Fuel B100 FAME, 168 Hrs	1.23	0.23
Fuel CE85, 168 hrs	1.88	0.25
Ozone	1.54	0.19
Wear Cycles = 900	2.05	0.23

In brief

- Reduced Friction by Nanotechnology (RFN) is one of the newest tools available for improving seal longevity and abrasion resistance.
- Nano treated seals show a 70% reduction in static COF, aggressive media resistance, and lower torque and loading properties.
- Coefficient of friction can be reduced by applying a nano treatment to rubber components

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The sealing lips of a radial shaft seal, following a test cycle with a standard FKM material (above, with crack formation when lifting) and a BRE-FKM material 75 FKM 260507.

“Base-resistant” FKM

Standard FKM materials based on bisphenol interlinked copolymers or terpolymers for axles and drives are chemically damaged by these high-additive oils. This is why so-called “base resistant” (BRE) FKM types were developed, as they exhibit a high degree of stability in high-additive oils. The material 75 FKM 260507 showed only slight changes to the mechanical properties when surrounded with the aggressive Castrol SAF XO motor oil at 150°C for 168 hours, while the standard FKM copolymer under the same conditions resulted in a reduction of the elongation at break by over 50 percent, thus limiting the sealing functionality. The new high-performance material 75 FKM 260507 also retains its seal functionality even after a 1000 hour test run in an aggressive long-life motor oil. The new BRE-FKM material thus offers the utmost durability in aggressive lubricants as well as a long working life.

The Simrit portfolio of FKM materials ranges from standard types to specially modified mixtures with the highest chemical resistance, all the way to low-temperature flexible materials for dynamic applications, as well as materials such as 75 FKM 170055 which are optimized for long service life and harsh wear.

FKM for harsh and demanding environments

Seal elements made of fluoroelastomer materials are especially well-suited in environments where high thermal and chemical stability is needed. For especially problematic environments such as high-additive lubricants, Simrit has developed special FKM mixtures.

When selecting an appropriate material for seal elements, in addition to the temperature range in which the seal is used, it is essential to consider the particular liquid or gas with which the material will come into contact. As a result of the swelling behavior or shrinking, as well as the chemical durability of an elastomer, these media greatly affect the durability of a seal element.

Fluorine to protect against highly aggressive environments

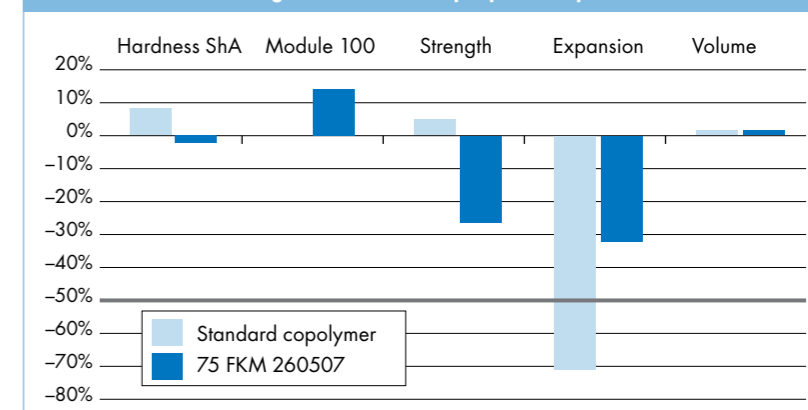
In all applications for which high thermal and chemical stability are important, fluoroelastomers of various types are particularly well-suited. The resistance of fluoroelastomers to high temperatures (for round-the-clock operation, these types of materials withstand temperatures up to 200°C) depends on the polymer structure and systems of cross-linking. This cross-linking can be created with

diamines, bisphenols, or peroxides. The chemical durability depends on the level the fluorine content. The higher the fluorine content, the better FKM materials are able to withstand highly aggressive environments.

Seal materials are subjected to especially harsh demands with respect to temperature and the surrounding medium in the case of utility vehicles and mobile machinery. Considering that high-additive motor oils and temperatures continue to become more extreme, thermal and chemical stability are becoming more crucial all the time. Simrit's low temperature compounds 70 FKM 6016 and 70 FKM 260737 for dynamic applications exhibit favorable swelling behavior as well as excellent abrasion resistance and outstanding compression set results. The material 70 FKM 260737 is especially well-suited for use with biodiesel or low-viscosity lubricants. The development of a new generation of long-life oils for

engines and drives has made it possible to increase service lives by more than 1000 hours. These oils are mainly mineral based, with a high percentage of amine additives.

Change in mechanical properties (percent)



Media durability of a standard FKM material compared to the special type 75 FKM 260507, in reference oil Castrol SAF XO at 150°C for 168 hours.



In brief

- FKM is characterized by its resistance against high temperatures and a broad spectrum of chemicals
- Simrit material 75 FKM 260507 offers the highest resistance against aggressive, amine containing lubricants
- Simrit offers a broad portfolio of FKM materials to meet any need



Any questions or suggestions?
Please contact
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The Rocket Boomer XE from mining and drilling specialist Atlas Copco in action.

Tough conditions, tough seals

The COP 3038 hydraulic rock drill from Atlas Copco is used in harsh territory under the toughest conditions. Nonetheless, the length of time required between service intervals is ever increasing. That's why high-quality sealing elements are indispensable.

The COP 3038 hydraulic rock drill from Atlas Copco, equipped with a nominal output of 30 kW, drills up to 30 meters deep (blast) holes into granite and many other hard rocks with a drilling speed of approximately 5.3 meters/minute. This powerful device from the globally operating Swedish company has an impact rate of 100 Hz and achieves 50 percent more penetrating power than its predecessor, the COP 1838. Despite the clear increase in performance, the device gets by with 10 percent fewer moving parts and thanks to a new impact mechanism design, it is 12 mm shorter and 5 kg lighter than its predecessor. Due to a hydraulic double damping system, the recoil energy of the rock drill is absorbed so that the drill steel is spared despite the high number of impacts. The hydraulic rock drill has N2-impinged damper accumulators that even out the pressure peaks in the hydraulic system, thereby reducing wear, both on the drill steel and on the drilling rig itself. To

further reduce wear, a double sealed flushing chamber prevents dirt and moisture from penetrating the system.

Customized and catalog parts

When it's a matter of preventing contamination of the pressure medium, which is disastrous for hydraulic devices, Simrit comes into play as the sealing specialist. As absolute precision devices with energetic peak outputs, the rock drills from Atlas Copco put the highest demands on the individual sealing components. For that reason, Simrit is a long-standing partner and preferred supplier that delivers both catalog components as well as customized parts developed jointly with the Swedish mining and drilling specialist. In addition, there is a regular exchange at management level about savings potentials and local stock keeping at Simrit for the drilling specialist. A Simrit specialist is assigned specifically for the close technical collaboration with Atlas Copco.

From the catalog product range, Simrit supplies, among other things, radial shaft seals, U-cups, PTFE seals, and for static sealing cover seals/Stircomatic as well as standard O-rings. Specially developed "reinforced" diaphragms are used in customized solutions. The diaphragms that were developed in close cooperation with Atlas Copco are used at various points on the rock drill. On the one hand, they have to reliably separate the hydraulic oil chamber from the nitrogen chamber, but on the other hand, they have to withstand the tremendous pressures in the chambers of up to 200 bar without being damaged.

Sought-after sealing expertise

Despite the tremendous impact rate and the extraordinarily fast impact mechanism of the rock drill, the components used are required to last longer and longer. "Our aim is for our rock drills to endure up to 800 hours undamaged in tunnel drilling and similar tasks in hard rock," says Lars Persson, Development Director of the Mining Division at Atlas Copco. He especially counts on Simrit's expertise, which is sought after both in the materials area and in the design area. The close and long-standing partnership between the two companies is a good precondition for this, since

there are many specialist teams brought in that are focused on the highest quality. Last, but not least, the global presence of the two companies is a decisive foundation for the success of future challenges.



COP 3038 hydraulic rock drill: highest requirements for seals

In brief



- A rock drill with high-frequency impact mechanism puts high demands on the sealing elements
- Simrit supplies cataloged products, as well as customized seals
- A long partnership on many levels exists between Simrit and Atlas Copco



Any questions or suggestions?
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Thermomix from Vorwerk is a multipurpose kitchen appliance for a variety of applications such as chopping and heating.



Multi-purpose kitchen aid

Simrit encountered one particular challenge involved in the sealing of the blade bearing of the Thermomix multipurpose kitchen appliance from Vorwerk: the lubrication oil normally used for its radial shaft seals was out of the question for this machine.

Is it a set of scales, an intelligent cooking device, or a mixer? In fact, it is all the above—and a bit more. The Thermomix TM 31 multipurpose kitchen appliance from Vorwerk combines the functions of more than twelve individual kitchen utensils, allowing you to prepare meals and drinks with a single device. The unit weighs, chops, mixes, stirs, cuts, crushes, grinds, pulverizes, kneads, and emulsifies. At the same time it cooks and steams. Whatever the heart desires, this machine can do it. All of these culinary arts are on the cutting edge, so to speak. When rotating to the right, the blade chops up the ingredients as finely as the operator wishes. Left rotation gently stirs sensitive foods like risotto and goulash, without chopping or otherwise damaging them.

Radial shaft seals for blade bearings

At first, the blade in the Thermomix looks no different than that of any other cold mixer. However, the stress on the roller bearing and its seals is much different with a hot mixer than with a cold mixer where simple lip seals are adequate.

In the case of the Thermomix, seals are needed that can easily withstand a cooking temperature of 90 to 115°C—and at high blade speeds and notoriously insufficient lubrication. In addition, the operator expects that the machine will stay firmly in place when the blade is rotating. Using a PTFE radial shaft seal and a solid rubber

BA-style radial shaft seal filled with grease, Simrit helps the kitchen device to run smoothly and prepare food successfully.

As already indicated, the general set of ambient factors poses a true challenge. Because it is an application used to process food, lubricating the radial shaft seals with oil, as is the case in most industrial applications, is not possible. The radial shaft seals used to seal off the blade bearings work under practically dry running conditions, in conditions where braising takes place, and where it can get quite hot and greasy.

Greases for initial lubrication

The dry running is compensated by an initial grease lubrication. The grease, which has to meet FDA specifications, was selected by Klüber, a company, like Simrit, also belonging to the Freudenberg Group. Simrit and Klüber have a great deal of experience concerning the compatibility of fats and oils with shaft surfaces and their sealing elements. For years now, Simrit has supplied Vorwerk with sealing solutions for Thermomix kitchen appliances. For the sealing of blade bearings, these have proven to be extremely long-life and dependable components.



Products from Simrit help to ensure that the Thermomix machine runs smoothly.

In brief



- In Thermomix kitchen appliances, high speeds and high temperatures are combined with insufficient lubrication.
- Simrit has solutions to meet all thinkable needs, even for kitchen devices à la Thermomix.
- Simrit's materials expertise and experience with the compatibility of sealing elements with greases and oils allowed the challenge to be solved competently.



Any questions or suggestions?
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O-ring form, fit, and function— FEA answers these questions with good science*

How do we know which O-ring is the right one for any specific application? How can we be sure that our selection will perform up to optimum standards? Finite Element Analysis (FEA) modeling finds the answers.

Particularly in aerospace applications, the customer and supplier of an O-ring rely on the part drawing and materials' specification to make decisions about whether the O-ring is appropriate for an application. That all works well, but there are many instances where the O-ring is supplied to all the documented requirements yet still leaks or fails in the application.

Aerospace application failures tend to invite a lot more attention than automotive application failures since aerospace

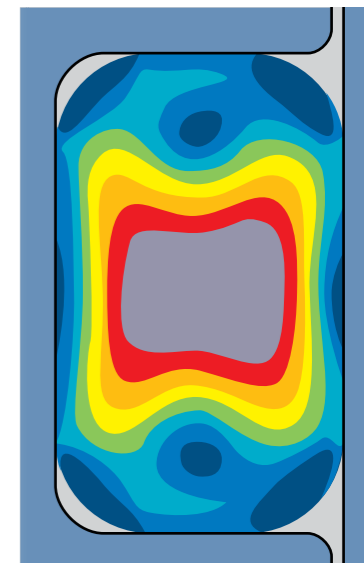
O-ring failures usually involve leakage and grounded aircraft or worse. Application experience demonstrates how scientific techniques—including gland analyses and installation analyses, testing at application temperatures in application fluids, FEA and simulated functional tests—provide problem-solving techniques for these demanding applications.

There are excellent industry-standard specifications for O-ring size, quality and material requirements. O-ring

manufacturers publish design guides which help the end user specify the proper O-ring, as well as design the mating gland. However, O-rings are manufactured to non-standard sizes and for non-standard mating glands. Performance of materials at application temperatures and pressures is not truly defined in many of the material specifications. Fit and function questions are not straightforward to analyze without thorough material models and Finite Element Analysis.

In most cases, elastomer materials for sealing applications are developed around existing or target specifications which generally define the basic mechanical properties needed along with some time-dependent properties such as thermal air aging, resistance to application fluids or compression set resistance. Generally, these specifications define the materials that will be suitable for an application. However, these specifications will not answer the question of how a rubber seal material will behave at application temperatures under application pressures. FEA can be used to further define the suitability of the material for the application and to troubleshoot application problems. The advantage of FEA calculations is they can be done without the expense of building test fixtures or

This representative FEA analysis diagram demonstrates stress levels in an O-ring cross-section.



building up components and evaluating the seals in the field. Traditionally, one of the issues with the FEA of rubber sealing systems is that rubber is a non-linear material. This has meant phenomenological models to curve fit stress-strain properties and iterative computer solutions. With current computer processor technologies, these iterative calculations have become fairly inexpensive to generate.

FEA is a critical tool for prediction

The use of FEA modeling has helped prove a change of material and demonstrates the huge effects very subtle gland machining changes can have on the ability of the O-ring to perform without material rupture. Mechanical property tests, immersion tests and compression set tests showed it is generally suitable for the application conditions. But without FEA, the customer may have had problems after placing it in the assembly and evaluating on the actual aircraft. We see many cases where FEA modeling predicted behavior of actual seals in the application and helped develop new, broader range materials for O-ring applications. FEA modeling can be

used to troubleshoot potential application problems, as well as to research potential assembly issues with O-rings and other rubber seals. Standard tests required by the industry specifications will not help in these issues and in this type of problem solving. Newer tests of rubber seal durability, such as Compression Stress Relaxation, will provide no insights into these types of applications issues. Only with a thorough analysis of the material behavior, along with the application conditions using FEA modeling, can we accurately predict O-ring performance in the application and troubleshoot problems to answer questions about form, fit and function.

*As previously published by Design News on November 17th, 2008, in the magazine's Fluid Power/Power Transmission special insert. www.designnews.com

In brief



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