

simrit®

The Magazine for Simrit Customers

December 2006

insight.

Heavy Equipment Construction Seals for Leviathans



Material 92 AU 21100

Tough Like an Emperor Penguin

Civilian Aviation

Flying High with Sealing Safety



The President's Message:

Simrit – Everywhere You Look

David R. Monaco,
Simrit® Americas

"Globality" is part of our nature. Our production and sales companies in more than 30 countries in North and South America, Europe and Asia manufacture and market high-value sealing components worldwide. Our newest sales subsidiary in Moscow was opened in January 2006 and supplies customers in Russia, the Ukraine, in Belarus and Kazakhstan with Simmering oil seals, Merkel hydraulic products, ISC O-rings and vibration control components.

It is exciting to see Simrit products in use on every continent. Our story on pages 12 and 13 highlights Simrit sealing solutions in use in the cold and remote environment of Antarctica. Simrit components are not limited to every corner of the world, but are also used above and below the surface of the earth. Some of our airborne applications are spotlighted in the article on Eclipse Aviation's "air taxi" aircraft, while subterranean seals are featured in the cover story about "Seals for Leviathans". One of these leviathans is the world's largest tunnel boring machine in use in Madrid, Spain. The fact that Simrit spans such a wide variety of industries indicates a breadth of sealing solutions that is unmatched and promises the most robust and reliable components for your sealing needs.

However, all of our technology and product breadth is meaningless without the ability to apply it to your unique situation. This is why our sales and application engineers, product design engineers and process technicians must all stay in touch with you, our customer. It is through this

joint effort that true sealing innovation occurs. This is one reason that we have recently added Imperial Rubber of Nisku, Alberta, Canada to the Simrit family. Their reputation for customer service and fulfilling customer needs in the oil and gas industry makes them a perfect fit. You will be hearing much more about the oil and gas segment in future editions of this magazine.

In this edition of "Simrit Insight", you will find new developments and interesting product solutions from the Americas, Europe and Asia. I would love to hear your feedback. Feel free to send your comments to Insight@simrit.us and please enjoy this issue.

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Cover Story

On the cover: The largest tunnel boring machine in the world was developed by Herrenknecht AG in Germany. The technical details are discussed in our story on page 6. These types of exceptional machines require precise sealing solutions. Simrit offers both large compression seals as well as meter-long profiles. Our technicians can now join profiles with large diameter widths at the joint through vulcanization.



Simrit Service Center Cramlington 15,000 O-rings in Stock



Diane Reach leads the Cramlington Service Center.

The new Cramlington Simrit Service Center has over 15,000 different articles in stock. The service center located near Newcastle in the northeast of England offers a very comprehensive product range of O-rings and access to the entire Simrit sealing

range. "We either have the required part in stock directly or we can supply it within one day", says Operations Manager Diane Reach (photo). She emphasizes that the service center is completely focused on quality and in many cases, not only fulfills the expectations of the customer, but rather exceeds them.

Among the service center's customers are international heavyweights in aerospace like the French Snecma and the British companies BAE and Rolls-Royce.

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DKG Prize

Award for Circuit Board

Simrit's "flexible circuit board with seal" received the 2006 German Kautschuk-Gesellschaft award in the elastomer manufacturing category.

In this combination of circuit path and seal, the sensors in the medium side and the plug connections of the ambient side are directly in contact with each other. These components can additionally be joined with a mount – an existing housing cover for example.

The award was presented during the opening ceremony held in early June 2006 at the German Rubber Conference held in Nuremberg.

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Materials

The characteristics of elastomer parts can also be controlled through the joining of the rubber with metal and plastics.

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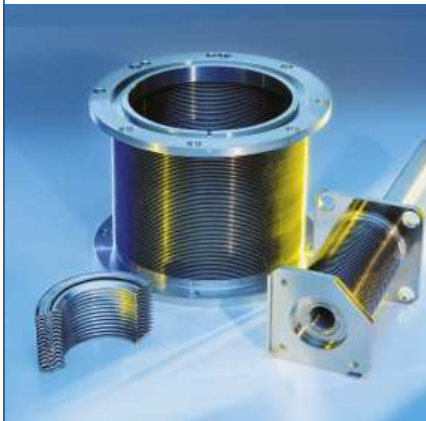


Simrit Unveils Welded Metal Bellows

Durability, Flexibility and Corrosion Resistance

Dedicated to advancing technology and maintaining high standards of quality, Simrit has introduced its new line of welded metal bellows for semiconductor manufacturing equipment and a broad range of other markets, including: aircraft

Simrit's welded metal bellows can secure a wide stroke within a limited space.



and aerospace, marine, nuclear energy, medical and pharmaceutical, and petroleum refining and petrochemical.

"Our welded metal bellows have the ability to perform in a wide range of stressful environments, including ultra-high vacuum, high pressure and extreme temperatures, making them an ideal product for a great number of applications," said Vinay Nilkanth, vice president of business development for Simrit. "Additionally, they provide the durability, superiority and quality Simrit is known for supplying to its customers."

The Simrit line of welded metal bellows are nesting-type bellows, which are produced using a

unique ultra-thin metal plate welding technology. These bellows can secure a wide stroke within a limited space, which achieves a compact equipment design. Simrit welded bellows can be made almost completely with weldable materials, guaranteeing design efficiency for each specification and providing optimal performance. Simrit's welded metal bellows offer a range of features and benefits, including: product longevity, corrosion resistance, sealing performance, cleanliness, spring character, flexibility, as well as pressure and heat resistance.

For more information, visit the Simrit website at www.simrit.com.



Seminars

All dates at a glance: www.simrit.de/academy

17th Innovation Forum

Smart Symbiosis

The last Innovation Forum has been taking place on November 30th in Weinheim, Germany. Broadcasting via the internet, now in five languages, enabled a larger market to participate in the event. "Intelligent Symbiosis" took in a wide range of topics for this innovation forum, for example symbiosis between elastomer and non-woven material and between seal and sensor. Further topics for the 17th forum have been mould joining for extrusion profiles, multipol-final control elements for industrial applications and a new PU rod seal with optimal extrusion protection.

You can find out more at www.simrit.de/innovation_forum

ABES TECHNOSEAL, our new Preferred Distributor

South African Simrit Experts

The sealing specialist Abes Technoseal is Simrit's new Preferred Distributor in South Africa.

Founded in 1937, the company has 60 employees and is located in Elandsfontein in the Gauteng province, the financial and economic center of the Republic of South Africa.

Abes Technoseal belongs to the Hudaco Group (a Johannesburg stock exchange listed company) which consists of individual companies for technical trade and whose business areas include bearings, drive technology, safety equipment and parts for the automotive sector. Abes Technoseal is the sealing specialist of the group

and concentrates on the hydraulic, pneumatic and sealing technology areas. The company, with its decades long co-operation with Simrit, uses the dense network of over 50 subsidiaries of the Bearings International concern in the Republic of South Africa for the distribution of the products. Naturally, Abes Technoseal always wanted to be more than merely a technical wholesaler. Thus, they offer additional services like application and installation training, product selection support as well as support with troubleshooting and fault repair.

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Simrit at Farnborough 2006

Towards European Aerospace Market

In an effort to mark its entry into the European aerospace market and to meet several current and potential new customers, Simrit recently exhibited at the Farnborough International Airshow in Farnborough, Hampshire, England. This is the first year Simrit participated in the show, which is one of the largest aerospace events in the world.

The 45th biennial aerospace extravaganza hosted more than 1,480 companies from 35 countries and trade visitors from around the world. Simrit's participation at this event demonstrated its grow-

ing commitment to the global aerospace market. Simrit is dedicated to using its engineering expertise and advanced technology to offer its customers all over the world superior sealing solution products. While at the show, Simrit unveiled its aerospace marketing brochure along with several other pieces of aerospace oriented literature to introduce its products to the market. All of the literature that was unveiled at Farnborough is available on the Simrit website, www.simrit.com.
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The 45th biennial aerospace extravaganza hosted more than 1,480 companies from 35 countries.

SEMICON WEST 2006

Simrit Unveils New Products



Simrit has well equipped clean room facilities for the semiconductor industry.

More than 40,000 people attended Semicon West 2006 held mid-year in San Francisco, CA. The semiconductor trade show is known to attract the broadest and most global audience from the world's leading microelectronics companies. This year Simrit introduced two new product lines to this fast-paced industry. The first, the company's line of magnetic fluid vacuum seals, is specifically developed for high-performance,

low-friction, rotary seal applications. Used on semiconductor manufacturing equipment, the Simrit magnetic fluid vacuum seal design utilizes magnetic force to maintain the magnetic fluid in a specific position around the shaft, which provides a liquid sealing barrier to fluids and gases. Also unveiled at Semicon West 2006 was Simrit's new line of welded metal bellows (see page 4).
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Magnetic fluid vacuum seal for the semiconductor industry.

Gas and Oil Industry

Simrit Acquires IRUC

In August, Simrit (through its parent company) acquired the assets of Imperial Rubber and Urethane Corporation (IRUC) helping to expand the division's presence in the oil and gas industry. Simrit gained Imperial Rubber's standards of quick response time, depth of market knowledge, strong customer relationships and competitive pricing. Simrit also gained Imperial Rubber's wide range of product lines, including well service products (swab cups, pipe wipers and blow out preventer parts), cementing products (plugs and packer cups), bonded seals and packer elements and inflatable packers. In turn, the customers of the former Imperial Rubber will have access to Simrit's O-rings, polyurethane seals, shaft seals and other fluid power and elastomeric products. Simrit is dedicated to maintaining and further developing the service level which customers have come to expect from Imperial Rubber. As part of Simrit, Imperial Rubber will continue to manufacture oil and gas products at its two facilities located in Nisku, Alberta, Canada and will distribute these products through Simrit.
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Simrit Offers Precision Products for Heavy Duty Construction.

Seals for Leviathans

Be it rotary assemblies for wind power plants, filters for ore processing plants or boring machines for motorway tunnels – these types of gigantic machines require exceptional seals. Simrit offers world-class seals in the shape of large form seals as well as meter-long profiles.

The M-30 motorway project in Madrid is an exceptional tunnel. With an inner diameter of 44 feet (13.45 meters), the tunnel – which will work to reduce the traffic in the center of the Spanish capital starting in 2008 – will have three lanes for heavy freight vehicles in each direction with additional footpaths along the tunnel walls. A depth of 246 feet (75 meters), as well as pressures of six bar place the highest importance on accurate people and technology.

Independent cutting wheels

Not only is the 2.24 mile (3.6 kilometer) tunnel remarkable, the boring machine being used to create it is exceptional as well. Herrenknecht AG, an international specialist for tunneling technology, developed a unique cutting wheel concept. An outer cutting wheel is attached alongside a seven meter diameter inner cutting wheel on the same working level for a maximum boring diameter of 50 feet

(15.20 meters). Both cutting wheels (yellow and red in the picture) can be rotated independently and counterclockwise. Three conveyor screws are integrated into the boring shield and transport the excavated earth out the rear of the machine. The torque of the machine (over 125,000 KNm) is powerful enough to raise a large commercial airliner of over

400 tons using a long lever arm. The seals in the tunnel boring machine also reach proportions not found anywhere else.

Tunnel boring below the waterline

The Merkel seals supplied by Simrit for the main drive have a nominal diameter of 25 feet (7.6 meters) and are currently the

In brief

- Simrit seals are utilized in the main drive of tunnel boring machines with a nominal diameter of 25 feet (7.6 meters).
- Construction and design of the sealing elements occurs in corporation with the machine manufacturer.
- Extruded profile seals are used for the sluice doors of the driver's cab of the tunnel boring machine.

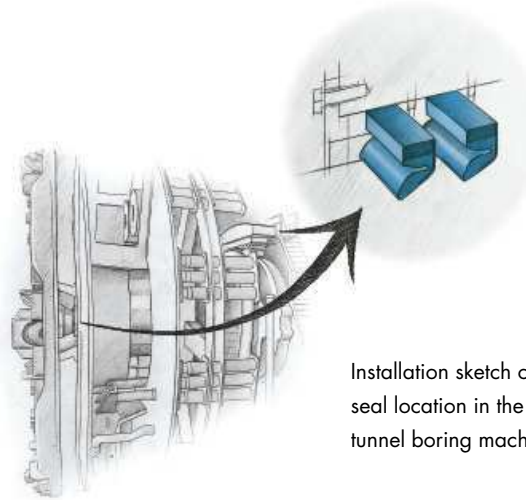


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largest seal supplied by the company. The giant seal ring with the main bearing protects the heart of the tunneling machine. This main element is a multi-rowed roller bearing with an eight meter diameter and weighing 20 tons which incorporates the rotating cutting wheel of the machine and braces against the enormous feeding force and powerful torques.

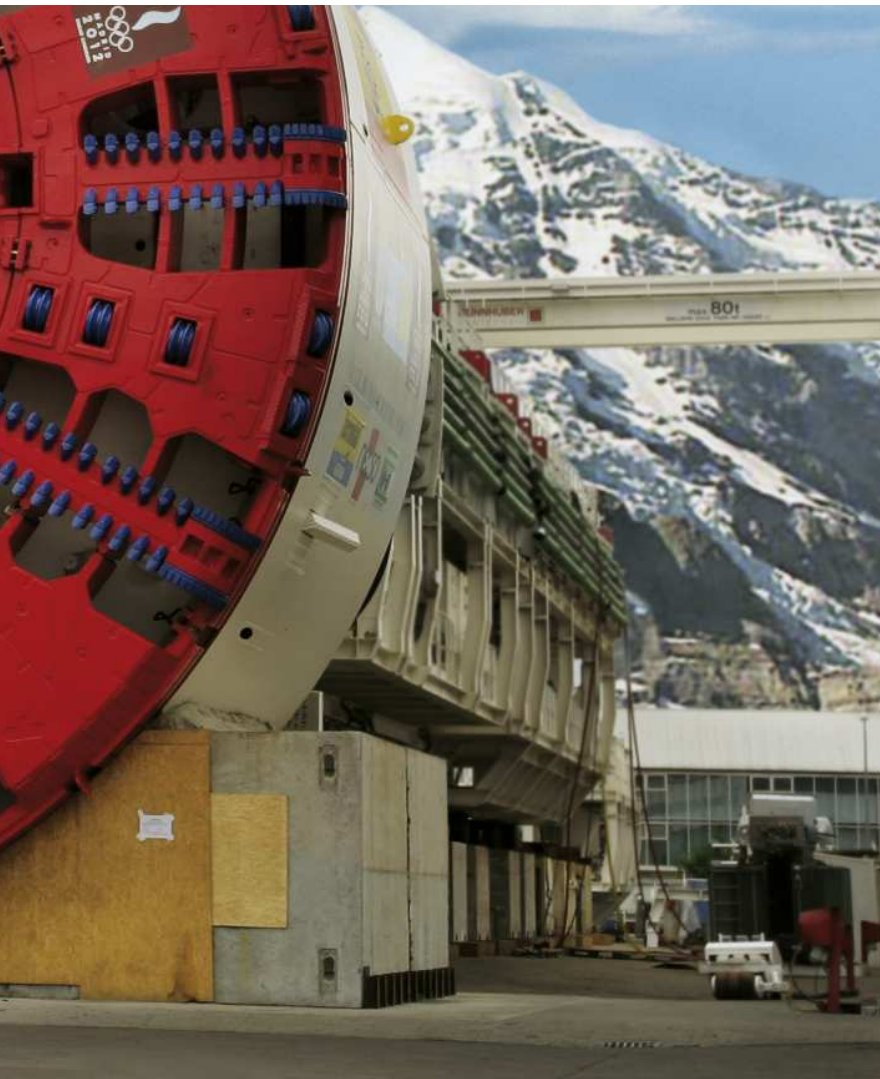
The main bearing seal must first and foremost protect the roller bearing on the outside from the intrusion of excavated material such as sand, water and rock. At the same time, it must prevent oil discharge. Large loads occur at the seal location. In addition to the accumulation of dirt and the continual rotation throughout the year,

these loads produce high excavation pressure and vibrations. There are also dimension-related larger component tolerances and increased play during operation due to wear and deformation.



Installation sketch of the seal location in the tunnel boring machine.

Merkel seals supplied by Simrit for the main drive of the tunnel boring machine (cross-section).



Tunnel boring machines with shield driving are increasingly used worldwide for difficult large tunnel projects. The machine can be used for a variety of applications, ranging from hard rock tunneling machines (Gotthardt tunnel in Switzerland), to tunnel projects deep under the ocean floor (Westerschelde tunnel in Belgium), to under riverbeds (fourth Elbe tunnel tube in Hamburg, Germany).

Tunnel borings 200 feet (60 meters) below sea level have already been achieved and other projects at approximately 500 feet (150 meters) below the waterline are being planned. The operating pressures, which need to be sealed at the seal location for such projects, can be up to 1.5 MPa for seal diameters of roughly 20 feet (six meters). In addition to the German Herrenknecht AG, the Canadian

The world's largest tunnel boring machine by Herrenknecht located in Madrid, Spain is used for boring a 2.24 miles (3.6 kilometer) long vehicle tunnel.



Joint vulcanization

Profiles, cord rings and even hose rings are manufactured through an injection-molding process (extrusion process). Depending on the required diameter for the application, the products are then curved and bonded with adhesive (cyanoacrylate for example). Simrit has many decades of experience in this sector, and realizes that the joined edge is a potential weak spot of the seal. An attractive alternative is the vulcanization of the joint – a process that Simrit has mastered for large cross sections and a variety of materials. This process has been successful for seals of giant rotating blades of wind power plants which are subject to extreme weight. Together with the rotating assembly manufacturer Rote Erde Hoesch, Simrit has developed a seal that is vulcanized at the joint.

The elastomeric material 70 NBR 215 544 is resistant to the aggressive hydraulic oils of the blade regulators and has also passed the ozone protection test in the laboratory. Additionally, the material can be processed in an extremely cost effective way.

Blades of wind power plants currently reach lengths of up to 328 feet (100 meters) and must be able to move in response to wind conditions.

company Lovat has to be mentioned as one of the specialists in this heavyweight profession.

Application consulting

The seal rings of the TBM series have been developed specifically for these hard conditions – from the profile design to the materials selection to the manufacturing methods – and have already proven themselves in hundreds of tunnel boring projects.

Construction of the sealing location, selection of the lubricating system and design of the seal elements are done in cooperation with the machine manufacturer and are individually adapted for each application. Lastly, the

application technology experiences from decades of cooperation are a significant benefit. Simrit has developed unique, innovative manufacturing methods for the production of sealing components. For example, special sealing rings 33 feet (10 meters) or larger can be manufactured as endless, compression molded rings, without joints, in the tightest tolerances.

From consulting to the packaging according to code (via FEM supported profile design), to materials development in the material laboratory, to the production and quality assurance, the respective plant manufacturer



Full program: 3500 seal profiles

Be it tunnel boring machines, ship motors or hatches, whenever large sealing locations are difficult to seal, or can only be sealed with costly compression seals or ISC O-rings, consider seal profiles and cord rings. With a proven program of over 3500 seal profiles, Simrit offers solutions for various applications.

Moreover, any number of special profiles can be developed in cooperation with the user. Rock grinding seals and ore processing seals are just some of the products Simrit produces that are 100 meters long and bonded to another large profile. While rock grinders mainly need to be sealed against dust, ore processing plants release various forms of vapors that are hazardous to the environment. Simrit has extensive experience with chemical resistant material mixtures. Since Simrit has its own tool construction and testing laboratories, quality control is ensured. Simrit has earned its ISO/TS 16949 certification. As a materials specialist, Simrit can make over 2500 different elastomer mixtures from its own formulas that are available for various applications. Moreover, new materials are continually being developed in Simrit laboratories for special customer requirements, all specific to customer requests.

Top photo: Testing the tensile strength of a Simrit material. Bottom photo: Simrit produces profiles from the most diverse materials.

Seals in rotary assemblies of wind power plants are subject to extreme conditions.

has access to specialized sealing technology knowledge through Simrit. In the event of an on site installation of seals, special cutting and bonding technicians are available as needed to replace seals in the tunnel.

Profiles and compression seals

In addition to the main bearing seals described above, there are numerous other sealing locations where Merkel sealing components are successfully being used. Sealing of articulated joints and pumps, screw conveyor bearings, as well as rotary unions are developed directly with the component suppliers.

The same applies for numerous hydraulic motors and hydraulic cylinders. For the sealing of the sluice doors of the tunnel boring machine, Simrit supplied elastomer profiles manufactured with the extrusion process which are then bonded or vulcanized at the joint.

Such profiles are usually more cost-effective for specific sealing locations (and often make more sense technically) than compression seals or O-rings (see box). In addition to large tunnel boring machines in shield drive, remote controlled micro machines (used for tunnel operations) and other drilling machines use Simrit sealing components.



Simrit Activities in Russia (CIS)

Contribution to Industry Modernization

As the exclusive "western" seal manufacturer, Simrit has its own subsidiary in Russia. Its headquarters in Moscow is complemented by specialized sales engineers in the most important industrial regions of the Russian Federation, Belarus and the Ukraine.

Satisfied customers are the best resource to gain new business. Satisfied customers who speak loudly and clearly are even better. One such Simrit customer is the traditional excavator manufacturer Kraneks of the Russian Federation. Kraneks' headquarters are located in the architecturally beautiful city

of Ivanovo located some 217 miles (350 kilometers) north of Moscow. Kraneks touts the use of Merkel hydraulic and hydrobearing seals in its brochures. Additionally, the innovative Hydrobearing VL is being incorporated into the company's construction machinery in the future.



The Russian excavator manufacturer Kraneks touts the cutting-edge technology of its suppliers. Simrit is one of them.

КАБИНА



Прочная и просторная кабина экскаватора EK 220-06 имеет все необходимое для максимально комфортной и продуктивной работы оператора. Кабина герметизирована, имеет высокую степень шумо-, тепло- и виброизоляции. Эргономичное кресло, новый многофункциональный пульт управления, удобное размещение и высокая чувствительность блоков управления обеспечивают высокий комфорт и безопасность работы оператора.



Первый лок



Легко снимающийся мощный полусферический коврик



Увеличенный угол развала ступицы цилиндров

Блоки управления

Блоки управления "Bosch Rexroth" (Германия) обеспечивают точное и плавное выполнение всех рабочих операций при низких управляющих усилиях, что способствует достижению максимальной производительности и комфортности. На блоках управления имеется кнопка включения звукового сигнала и кнопка включения режима гидросистемы "Power Boost".

8.9 Отопитель

Мощный отопитель "Eberspaecher" (Германия) предназначен для поддержания оптимальной температуры в кабине. Разводка потоков воздуха от отопителя предотвращает замерзание стекол кабины и обеспечивает хорошую видимость.



Successful seminar in the steel capital

It's no question that Simrit has arrived in Russia and in many other countries of the former Soviet Union (CIS). Simrit is not only mentioned in local company brochures, but has established itself with a warehouse in Moscow. Step by step, sales engineers are arriving at the most important industrial centers of the giant country and in centers of Russia's not so large neighbors, namely, Belarus and the Ukraine and Kazakhstan – an up and coming industrial power where, the Russian spaceport Baikonur is located.

Reinhold Prinz, director of the Simrit branch office in Moscow observes that "The Russian economy and the economies of its neighboring states Ukraine, Belarus and Kazakhstan will develop very dynamically in the coming years,". He goes on to say that Simrit wants to be there from the very beginning and contribute to



Simrit is well placed with its Russian headquarters and warehouse in Moscow and sales engineers in the prominent industrial centers throughout the country, as well as the remaining CIS states.



Simrit specialists with Kraneks engineers in front of a Kraneks factory building in Ivanovo.

the rapid modernization of the CIS industries. The Moscow branch office was opened in early 2006. In February, Simrit was the host of a sealing seminar with over 100 visiting guests in Magnitogorsk, located roughly 1200 miles (2000 kilometers) east of Moscow. The city in the southern Ural Mountains is the largest steel site of the Soviet Union. Along with MMK, it currently houses the largest steelworks in Russia with 60,000 employees. The Simrit conference not only attracted the sales and technical management from MMK, it also attracted management from other steel works of the former Soviet Union. Additionally, employees from companies that produce machines for the creation and processing of steel attended the conference.

Four main segments

The metallurgy and steel branches belong to one of the main market segments that Simrit has formed in Russia and in the other CIS states.

Further important branches are the industries of construction and agricultural machinery, mobile hydraulics and diesel engines. The company's main product groups are also defined: Merkel hydraulic seals, ISC O-rings and Simmerrings. In the hydraulic seals and Simmerrings market, Simrit was able to double its sales volume in the CIS states last year. Even with a branch office and warehouse in Moscow and technical presence in the most important industrial centers, Simrit still plans to expand its entire product range in the coming years. Based on the company's relationship with Kraneks, this is a promising prognosis.

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Russia: 'crisis' years are over

After many years of crisis, the Russian Federation is currently in an economically stable situation. Russia and some of the remaining CIS states, in addition to China and India, are considered to be one of the largest growth areas worldwide. In the last five years alone, the Russian economy has grown at an average rate of 6.5 percent. Higher crude oil and natural gas prices lead to a balance of trade surplus in the last year.

The economic and financial crisis of 1998 is over and the coming years are looking positive. Many of Simrit's general industry European customers, for example Festo, Danfoss, Camozzi, Merloni, Bosch Rexroth, Demag, INA, Müller Weingarten, Uhde and Wilo are already active with their own subsidiaries in Russia and some of the former Soviet Union's successor countries.

Low-temperature PU Materials in Use in the Antarctic

Tough Like an Emperor Penguin

In a loading crane on a Japanese Antarctic research station, Simrit's Merkel seals, which are based on the low-temperature polyurethane 92 AU 21100, have passed their most extreme durability tests to date with flying colors.



The extension cylinder of the loading crane currently works absolutely leak-free.

The loading crane of the Austrian company Palfinger is only in use for three months out of the year. During these months, it moves a 200 kilogram heavy cable drum and cable rollers with one ton of weight. The crane only operates in the warmest months of the summer when it's still only -4 to -40°F (-20 to -40°C). In the remaining months, it stands frozen solid in

the freezing temperatures covered with ice and snow. At times, temperatures during these months fall to -105°F (-76°C) in extreme cases. By now, you've already figured out the location of the loading crane. It stands in the largest natural freezer on Earth – the Antarctic. More precisely, at the Japanese Dome Fuji research station. Two years ago it was delivered there by the Japanese company Furukawa, trade partner of Palfinger in Japan.

Loading cranes are often used under extreme conditions. The Antarctic location is definitely one of exceptional extremes. With its 13.2 million square kilometers of land surface, the Earth's sixth continent is clearly larger than all of Europe with only 10.5 million square kilometers and holds records in many areas. For example, up to 98 percent of the hospitable living and working space is permanently covered by an ice cap which can reach a thickness of nearly 3 miles (5 kilometers).

Nearly 90°C below freezing point

Besides being the geographic South Pole (the magnetic South Pole lies roughly 1600 miles (2,600 kilometers) below the South Pole of the continent), the Earth's cold pole is located on arguably the least researched land mass on the planet with a record low temperature to date of -129°F (-89.2°C). But even in such a life threatening environment, there are

many animals and plants native to this climate that are exceptionally well adapted. One example is the emperor penguin which raises its offspring in the Antarctic. Like the emperor penguin, there are also a few people who work there – primarily scientists and technicians – and their machines need to be as resilient as the emperor penguins to be able to beat the freeze that the Antarctic serves up. It is clear that under such extreme



In brief

- Seals from the low-temperature material 92 AU 21100 were installed in a loading crane in the Antarctic.
- At the time of commissioning, the oil had a temperature of -18°F (-27.8°C).
- The outside temperature at the time of commissioning was -17.5°F (-27.5°C).
- Under these conditions, the use of normal seals resulted in leaks in the area of the boom and extension arm cylinders.
- With the installation of the seals based on 92 AU 21100, the seals functioned flawlessly.



Information at www.simrit.de/E/insight
 Contact: mathias.burkert@freudenberg.de
 Brochure „Merkel low-temperature polyurethane“
 at www.simrit.de/E/insight/fields_of_application

conditions even the seals in the crane have to greatly surpass normal standards. A seal is needed with material properties that are as tough as an emperor penguin. Even very good seals in standard materials quickly reach their limits here. And if that seal or “link in the chain” fails, then the entire tool stops working. This is even more disastrous with a machine that only works a quarter of the year.

Converting to low temperature PU

For the crane manufacturer Palfinger and Japanese researchers and technicians, the Simrit developed low temperature material 92 AU 21100 (also see Simrit insight 2/2005, pg. 10) is an enormous gain in productivity.

For the men and women on Dome Fuji, Simrit seals are of enormous importance at all times. Simrit engineers know the advantages of low temperature polyurethane seals compared to the previously installed normal seals. There was no comparison between the two seals when an oil leak occurred in the extreme climate one summer on the cylinder seals of the boom and extension arm. To prevent future leaks, in the 2005/2006 season, the crane was changed to seals manufactured from the low-temperature polyurethane material.

The material retains its flexibility at temperatures as low as -58°F (-50°C). The first test run with the newly installed seals occurred on January 20, 2006 – Antarctic midsummer – when the outside

temperature was -17.5°F (-27.5°C). The oil used in the crane (AVIA Artic32) had a temperature at the time of commissioning of -18°F (-27.8°C).

No more leakage

The temperature range of the seal material offered a sufficient margin of tolerance in order to also still be serviceable in extreme situations. No additional oil leakages have occurred in the area of the boom and extension arm cylinders since the installation of the special Simrit seals. Apparently, the long period of immobility of the crane with low temperature as low as -105°F (-76°C) have not had a negative effect on the behavior after the thawing and commissioning at the start of the Antarctic summer.



Loading crane from Palfinger at the Japanese research station Dome Fuji in the Antarctic.

Simrit Supplies Sport Motorcycle Manufacturer KTM

Day-to-day Quality Rally

Sport motorcycles from the world-famous Austrian sport motorcycle manufacturer KTM are tested on race-tracks all over the world, including the Dakar Rally. But before they can be tested on a racetrack, the day-to-day rally of quality has to be won. Naturally, this pertains to suppliers like Simrit.



KTM sport motorcycles can handle every type of ground condition: 950 Adventure Machines on a Fjord in Norway (left), a Super Enduro 950 R at the Dakar Rally in the Sahara (middle) and a 990 Adventure on the beach on the Canary Island Fuerteventura.

KTM is a master of its trade and a proven world champion many times over. One hundred and twenty world championships (60 in the last five years) have been achieved by the Austrian sport motorcycle manufacturer to date. Six of these victories were won at the Dakar Rally in Africa. The company from the Upper Austrian township of Mattighofen near Salzburg is one of the most successful and well-known brands in international motor sports.

KTM Motorcycles, which are exported all over the world, are known for their first-class characteristics such as low weight, high performance, exceptional handling and unmistakable design.

Rapid development cycles

KTM sport motorcycles are oriented to competitive sports, but can be used for both professional and recreational use. High-quality components and continual technical advancements shape the entire KTM model range.

KTM's main product category consists of off-road motorcycles for enduro and motorcross, although more street models are being added. The Product development cycles are as fast and robust as KTM motorcycles: one to two new models are brought to market each season. Future plans include the production of its own four-wheel racing

sport motorcycle which is currently being manufactured in Europe's most modern motorcycle factory in Mattighofen.

In recent years, KTM has doubled its production capacities due to new factory facilities.

KTM engineers are working on the development and design for future motorcycles. The company, which currently employs 200 employees, is already testing the new prototype motorcycles at the racetrack. Only the technically outstanding prototypes that withstand the selection process on the race-track will be brought into production.

Shortest path supplier policy

The production line in Mattighofen consists of four manufacturing lines with 16 stations per line and nine subassembly units. On average, 380 motorcycles are produced each day, each passing the appropriate testing.

In brief

- KTM motorcycles are suited for both professional and recreational riders.
- Only technically outstanding concepts that endure the rigorous selection process on the racetrack are brought into production.
- KTM practices the shortest path supplier to industry policy.
- Simrit supplies friction-optimized Simmerrings for the crankshaft seals of two-stroke engines.
- Numerous seals and formed components were developed specifically for the high requirements of KTM.



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The high quality that is required from KTM engineers and workers every day is also demanded of KTM suppliers. The company only utilizes suppliers that are located near KTM. This ensures flexibility, easy access to products and personal relationships between engineers with has had a positive effect on total quality.

Forty percent of all KTM suppliers are from Austria, with more than 50 percent in a 62 mile (100 kilometer) radius from Mattighofen. For decades, Simrit has been one of the preferred suppliers within

this radius. Numerous seals and molded components have been developed specifically for the technical requirements of KTM, for example the friction optimized Simmerring oil seals for the crankshaft seals of two-stroke engines.

Broadening of the model policy

Simrit also supplies KTM sport motorcycles with molded components like intake fittings, diaphragm mounts and valve stem seals, as well as decoupling

elements for the valve cover and housing seals. A cylinder head seal is currently in the works. In fiscal year 2004-2005, KTM increased sales and total revenue.

Besides the racing and off-road models, KTM will be integrating additional street motorcycles in its product range.

The creation of a two-cylinder 950 Adventure model as a "crossover model between off-road and street" was only the beginning.

Special Simrit products for the KTM sport motorcycles: (from left to right) intake fitting, Teflon coated Simmerring, valve stem seals, valve cover seals and reed blocks.



KTM artist's conception sketch for a four-wheel racing motorcycle.

Simrit as Supplier for Civilian Aviation

Flying High with Sealing Safety

The Eclipse 500 VLJ, a lightweight jet for six passengers, from Eclipse Aviation Corporation has Simrit on board. Both companies have entered into a long-term contract that will supply the Eclipse 500 VLJ program with Simrit seals.

A plane that acts as a taxi is not just a future concept for the engineers at Eclipse Aviation. Using novel technology, the aircraft manufacturer wants to add new dimensions to the emerging personal aircraft marketplace. Additionally, they want to achieve this with end prices that are half of what rival companies offer. Using a Pratt & Whitney engine, Eclipse builds a two engine turbo jet aircraft that can carry up to six passengers. Simrit's aviation seals are part of this revolutionary aircraft. A long-term contract has secured that Simrit of America will supply the Eclipse 500 aircraft with Simrit seals.

With the supplier's materials competency and strong technical ability, Simrit Americas combined with Simrit of Canada are firm partners to both Pratt & Whitney and Eclipse.



Eclipse wants to revolutionize the air taxi market with its innovative small jet planes, novel technology and sensationally low prices. Simrit is a proud supplier of the seals for the jets, as well as other aircraft parts.

The advantages of air taxis

The concept of the air taxi originated in the 1990s. The service is recommended for distances between approximately 300 miles (500 kilometers) to just over 1,200 miles (2,000 kilometers) and saves on time, especially on less frequently traveled routes. Plus, an air taxi flight eliminates commercial terminals and long layovers since small jet aircraft can serve many connections in a short period of time. The Eclipse 500 VLJ transports up to six passengers at a cruising range of approximately 1,100 miles (1,800 kilometers) with a speed of almost 430 mi/hr (700km/hr) and an altitude of up to 41,000 feet (13,500 meters). Until the Eclipse 500 VLJ, this type of transportation was too costly for use as a "taxi service." With a price tag of \$1.5 million U.S. dol-

lars, an end price far below its competitors, Eclipse is making the air taxi a reality.

Simrit securing human life

In addition to those individuals interested in leisurely travel, the Eclipse aircraft are also appealing to business people who are frequently required to travel short distances. The increasing production numbers are a direct indication that this creative system is a success at operating at the highest technical level. Simrit supports this technology with its specialized sealing and materials, as well as its technical knowledge, guaranteeing a reliable and safe functioning machine. Because one thing is clear: a seal must never fail in an aircraft where lives are ultimately depending on these inconspicuous rubber parts.

In brief

- Novel, small jets are a more reasonable alternative to the conventional airlines for less frequently traveled routes for frequent flyers.
- Eclipse Aviation not only provides superior technology, but has broken through the price barrier.
- Simrit supplies both the engine manufacturer Pratt & Whitney and the aircraft manufacturer Eclipse with aviation seals.
- Pratt & Whitney and Eclipse place their trust in Simrit's knowledge of materials and construction.



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Bill Bonder, Vice President Supply Chain, Eclipse Aviation, about Simrit:

“The Team Approach sets Simrit Apart From its Competitors”

Simrit is a proud supplier of seals being used in the Pratt & Whitney engine of the Eclipse “taxi” jets and the other parts of these aircrafts. Vinay Nilkanth, Vice President of Business Development of Simrit interviewed Bill Bonder, Vice President of Supply Chain, Eclipse Aviation.



Eclipse 500 Very Light Jet is making news these days, but I am sure it wasn't so in the early stages of development. Can you describe how this journey has been for Eclipse and from a supply chain standpoint?

During the early stages of development, the majority of the supply base was really skeptical of how successful Eclipse Aviation would be in the “taxi in air” concept, as well as the volumes we were predicting. Everyone viewed us as a “risky” investment from the tooling and product development standpoint.

Now, seven years after its inception, suppliers are viewing us as an “opportunity” and knocking on our doors.

What criteria did you use to select your supply base for such an important program? How did you implement your criteria in your selection process?

From the beginning, the main selection criteria used by Eclipse included several elements: partnership, long-term relationship and financial stability, product capability, consistent performance and the supplier’s transparency in open communication. In addition, Eclipse was also interested in working with suppliers with a quick ramp-up ability, cost effective solutions and high quality levels.

Why did you choose Simrit as a supplier for the Eclipse 500 VLJ program?

The Simrit name is recognized in the aerospace industry in a very positive way, especially related to product quality. It was clear from our early meetings with Simrit that the required attributes for supplier selection were all met.

What do you feel are the advantages of working with key suppliers like Simrit? What, in your opinion, is unique about Simrit's products and services?

Predictable delivery performance and high quality are almost a given with suppliers like Simrit. But what Simrit proved early on is its ability to be responsive to our needs, flexibility in design modifications and proven quality and product performance.

Since Eclipse's sourcing philosophy is dual sourcing whenever possible, how do you rate Simrit in comparison to its competitors?

Simrit is not only the top seal supplier, but is also one of the best partner suppliers across Eclipse Aviation's supply base. Simrit’s team approach between sales, manufacturing and customer service sets the supplier apart from its competitors.

Is there an advantage for Eclipse in that Simrit also works directly with Pratt & Whitney for its PW610 engine?

Simrit’s relationship with Pratt & Whitney – although not directly related – proved to us that Simrit is a valued player in the industry. It also showed that Simrit is entrenched at major OEMs in the aerospace industry.

How has Simrit helped you meet your goals for production quality?

So far, Simrit has done well with its product quality and initial cost expectations, as well as at the initial FAA approval stage. The key will be continued support during the ramp-up stage of the Eclipse 500 aircraft.

What do you see as the biggest challenges facing your supply chain management in the next five years?

Since most aerospace supply companies are familiar with low volumes, our biggest challenge is to make sure that the supply quality remains the same or improves as our volumes ramp-up.

What are the most valuable services Simrit can provide to you?

Continuity, quality and cost reduction initiatives combined with Simrit’s lean approach are very important to us. Those attributes, combined with the level of service, partnership and support Simrit is known for, will be an asset to our organization.

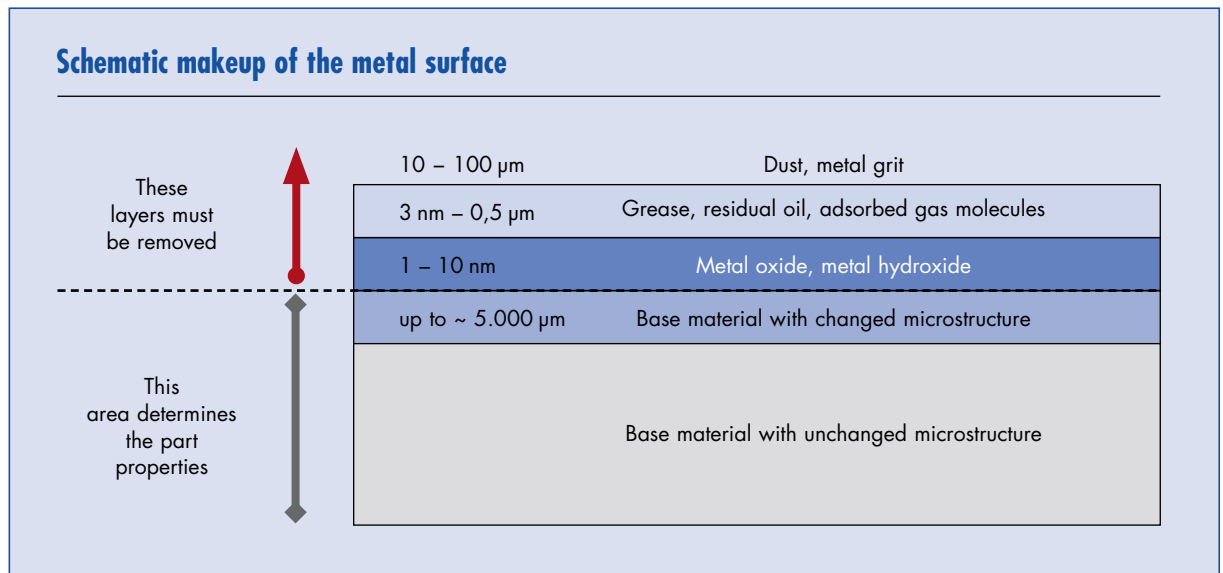
From “risky investment” to an “opportunity”: Simrit is the preferred sealing vendor for the Eclipse 500 VLJ planes.

Adhering Elastomers to Metal or Plastics

Bonding is Key for the Entire Component

The properties of elastomer parts can be controlled by the chemical makeup of the elastomers and by the adhesion of the rubber to metal and plastics. However, experience is required to ensure the connection is stable.

The layers above the dashed line can impair an optimal adhesion of the metal-elastomer-bond.



The combination of elastomers with special materials, such as steel, fabric or plastic, allows for the increased rigidity of the substance. In this way, anisotropic parts can be manufactured with

both high rigidity and high elasticity. This property profile can be found with rubber-metal and rubber-plastic combinations. Most composite bodies are subject to dynamic loads under diverse environmental influences.

Therefore, a firm and permanent bonding of the elastomer material to the medium is required in order to withstand the mechanical and chemical loads.

Composite systems normally consist of the rigid medium, an adhesive and the elastomer. Oxide layers form on the metal surface through contact with atmospheric oxygen.

These layers can impair an optimal adhesion with the elastomer. Furthermore, contamination by grease, oil, water or dust can prevent the optimal connection to the elastomer.

Pre-treatment of the metal parts

Normally, the stamped metal parts are provided with cutting and corrosion protection oil. To achieve a firm and permanent bonding of elastomer to the metal, the pre-treatment of the metal parts is essential. The metal parts run through a series of immersion baths on the “case treat line” that fulfill different functions:

- The degreasing of the metal parts occurs using strong alkaline aqueous solutions.
- Adsorbed oxide layers (rust) can be removed in the pickling baths.
- The metallic surfaces are very reactive after the cleaning and prone to corrosion. In an activating bath, the metal parts are prepared for the next step.

In brief

- Composite systems normally consist of a medium, an adhesive system and an elastomer.
- Impurities such as grease and oil prevent the optimal bonding to the elastomer.
- Pre-treatment of the metal parts is an essential step.
- After the metal preparation, the adhesive material is applied.
- Since the failure of the bond leads to the failure of the entire component, the rubber-metal bond is critical.
- The quality of the rubber-metal bond cannot be confirmed via non-destructive tests.

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- The superimposing of a layer of zinc phosphate serves as corrosion protection and the surface is enlarged at the molecular level ("molecular blasting"). Through phosphating of the metal surfaces, the adhesion to the elastomer is improved.
- Passivation of the metal parts occurs as a final step to prevent new rust formation.

In place of metal as the rigid medium, plastics are increasingly being used, keeping in mind that the components must have a good compatibility to begin with. In the best case, plastics can be bonded directly without pretreatment. The bonding occurs via mechanical anchoring (over spraying) or via co-vulcanisation. However, a firm adhesion is only achieved through a chemical bonding. After the metal preparation, the adhesive is applied. Generally, there are two possibilities: the use of a two-layer system consisting of a "primer" and the actual adhesive agent, or a one-layer system with only a bonding agent. With a two-layer system, the primer serves as the corrosion protection and ensures the bonding to

the second layer (adhesive agent). A prerequisite for a good adhesion is the complete wetting of the substrate surface and a cover wetting with the rubber matrix. To achieve a good adhesion, a matching of the vulcanization conditions with the reactivity of the adhesion system is necessary. The art of the pre-treatment lies (among other things, with the application of the correct bonding agent) in the achievement of an even bonding agent layer. Rubber composite parts are subject to various stresses when dealing with thermal and mechanical loading, corrosion or the exposure to the most diverse conditions. Adhesion faults can therefore criti-

cally impair the stability of the entire component and ultimately lead to the failure of the seal.

Peeling test

Unfortunately, the quality of the rubber-metal bond cannot be confirmed via non-destructive tests. Peeling tests are therefore used for testing the bond. Peeling strips are bonded to metal strips for this process. The metal strips are clamped and a strip of the elastomer is clamped in the tension testing machine.

Depending on the requirements, the elastomer is pulled at an angle of 90 degrees with constant speed. If a tear occurs in the rubber, an optimal adhesion is present. If the coating is partially or completely torn off, it is considered an adhesion fault. There are many causes of adhesion faults that range from impurities to an incorrect adhesive agent to processing faults. Since the failure of the bond leads to the failure of the entire component, the rubber-metal bond has a high significance for the manufacture of seals. Simrit not only has many years of experience with mixtures, it also has experience with elastomer composite adhesion with specific application requirements.

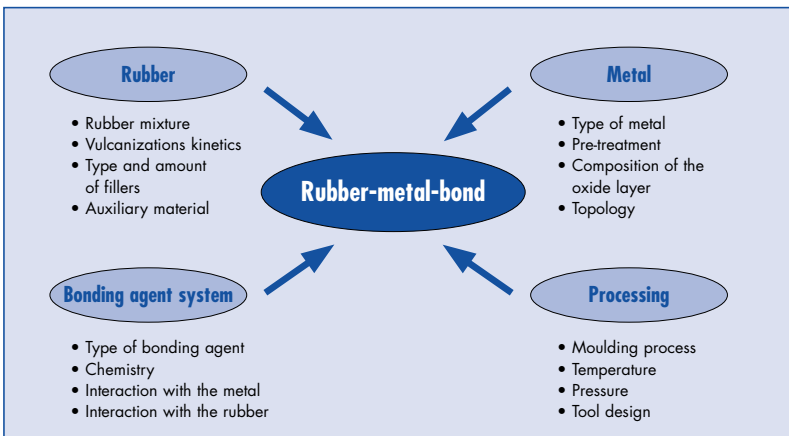


Pulling off of the elastomer from the metal (bonding fault).



Tear in the elastomer (good rubber-metal-bonding).

The quality of the rubber-metal-bond is determined by at least four parameters.





All these industries
share a common bond.
Simrit sealing solutions.



Simrit's technology expertise is more than experience. It's innovation.

Technology is a wide world unto itself, but there's one area where experts in every field agree: reliable sealing is essential to success.

Our mission serving every sector of the technology spectrum is to provide the most comprehensive range of sealing solutions for specific applications, and to be

ready with creative solutions when you develop new technologies.

As a leader and dynamic innovator in the sealing industry, Simrit, with its unique global network, plans for the continual expansion of our products and services—just as we're discovering new materials and exploring future processes.

The Simrit connection delivers the critical components for every industry: the most advanced products, superior service, innovative technology.

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