

simrit® insight.

No 1 | 2010

The magazine for Simrit customers

Reap the rewards

Practical innovations



Applications

Smooth solutions for rough environments



Applications

Hydraulic motors under pressure



Products

Compact industry piston accumulator for up to 350 bar



Materials

Optimised components with FEM

www.simrit.com



Freudenberg Group



Dr. Jan Gupta,
Simrit

Dear Readers,

In this new issue of Simrit insight, we would like to present to you the focus of our daily work. Fast implementation of our product innovations into industrial practice is a core challenge for us. For this, many different industry- and customer-specific requirements must be observed.

These innovations are often based on extensive materials competence. This way, we are able to provide you, our customer, with a clear technology head start for your application solutions. This new issue of Simrit insight introduces you to a few example development projects we undertook with our partners. For example, the long-term development partnership between the companies Claas and Simrit gave rise to many innovations that have now been successfully introduced on the market (Pages 6/7).

Other business relationships profiting from Simrit's materials competence are the partnerships with cable railway and conveyor specialist Doppelmayr and hydrant manufacturer Hinni. Cable railway specialist Doppelmayr required a low-friction bearing seal with a long service life and low energy consumption (pages 8/9). Hydrant manufacturer Hinni developed a unique control system for monitoring potable water grids and was looking for a hydrolysis-resistant material (pages 12/13).

We provide our customers around the world with this wide materials competence. The resulting reliability and long service life of our products are decisive aspects for our partners.

I hope that you will enjoy reading this new issue of Simrit insight and be inspired by it. We are looking forward to successfully putting your new ideas into practice.

Yours, Dr. Jan Gupta
Simrit

Trade fairs and events

Date	Trade fair	Place	Hall / Stand
19.07.–25.07.2010	Farnborough International Airshow	Farnborough – UK	Hall 4, Stand C 13
21.09.–25.09.2010	Husum WindEnergy 2010	Husum – GER	

Seminars

Date	Topic	Language	Place
19.05.–20.05.2010	Professional Seminar Fluid Technology: Sealing systems for pneumatic cylinders	German	Schwalmstadt

For further dates, please refer to the calendar of events on www.simrit.com

Imprint

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Aerospace partner

In recognition of its excellent quality, delivery performance and services, Simrit recently received the Gold Standard Award for Supplier Excellence at Pattonair's suppliers' conference. Simrit received this award for the first time and is one of the only two sealing suppliers who were given the award in recognition of their achievements. Pattonair, the Supply Chain business division of Umeco plc, is a leading service provider for the Aerospace and Defence market sectors and has operations in Asia, Europe and North America. The Pattonair Gold Standard Award is awarded to the twelve best suppliers every six months.

"It is a great honour that our effort, product quality and service levels have been acknowledged by Pattonair," says Stuart Campton, Simrit Sales Director, Aerospace Europe "We at Simrit strive to provide excellent customer service and quality products that are aligned to the needs of our customers." "This award is another milestone on Simrit's global journey," adds Vinay Nilkanth, Simrit Vice President Global Sales Aerospace.

Simrit at the Farnborough Airshow

We are committed to developing Simrit's position within the Global Aerospace market and will be reinforcing this message during the Farnborough Air Show in the UK between 19 and 25 July 2010. The Simrit stand location is C13 in Hall 4. Simrit consider the Farnborough Air Show as a prestige event for the Global Aerospace market. It is therefore a fitting platform for Simrit to continue to expand their European market presence.

During the seven day event Simrit's Global Aerospace team will be presenting their broad product portfolio and will meet with key suppliers and service providers operating within the Aerospace Segment. "The Aerospace Industry has travelled a great distance across a technology roadmap in a little over 100 years. The demand for innovative solutions offering increased performance and extended service life is more relevant than ever. Simrit's core strengths, a comprehensive product offering, excellent customer service range and a global footprint will make a compelling proposition for the global Aerospace Industry" explains Stuart Campton.



Ian Tumanow, Supply Chain Development Director Pattonair, (left) congratulates Stuart Campton. Rear: Craig Pilling (left) Pattonair and Scott Wilson, Simrit.

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Optimised components with FEM



TechDay for STIHL: Innovation in fast motion

STIHL is known around the world for its expertise in forestry and garden machinery.

The traditional Swabian company is one of the global leaders for portable power tools such as chain saws, hedge trimmers, brush cutters, motor scythes and hand-held cutters.

Like Simrit, it has a global sales and production presence.

Among others, the specialist for sealing and vibration technology delivers Simmerrings to the STIHL production sites in Germany, the U.S., China and Brazil. The TechDay, held for STIHL by Simrit

and the Freudenberg Group companies Klüber Lubrication and Freudenberg Filtration Technologies, therefore brought together many old acquaintances, whereas the products and information were brand new.

The event focussed on new processes for designing dynamic sealing systems under consideration of the tribological system (Lube&Seal).

A Year's Development

Other components were presented as well. Regarding static sealing elements,

for example, Simrit presented its proprietary methods for manufacturing components, optimised in regards of service life and design.

Other presentations dealt with seals for high-temperature applications and the possibility of reducing vibrations to increase user-friendliness. Ideas were exchanged animatedly during and at the end of the presentation.

This showed how important such Tech-Days, where Simrit's development work is presented virtually in fast motion, are in addition to close professional individual contact.

FDS Academy's offer becomes even more practice-oriented

Under the slogan of "The best consultants are your own customers," the FDS Academy reworked its training offer to further adapt it to customer requirements. The many comments and suggestions from the seminar evaluations were

a valuable help for optimisation. Initial online training is a prerequisite for participation on many of the attendance seminars. Therefore, the Web Based Training Standard Level was reworked and the offer was complemented by add-

ing the Advanced Level with more detailed technical information.

The attendance seminars' concept for Simrit's different product groups is now even more practice-oriented. Since 2009, the seminars are usually offered at the production sites that also are responsible for development of the respective product group.

The on-site specialists support the FDS Academy's lecturers with current know-how. With the new concept, participants can profit from programmes connecting the FDS Academy's theoretical know-how to the site's product expertise. Last year, a total of six new seminars was offered. In addition to the professional seminars, which are targeted at employees from sales and marketing, application technology, construction, maintenance and quality management, seminars for development practice experts are also available.

The demand of customised in-house seminars has also risen greatly. Therefore, the FDS Academy now also offers more of those.



Optimised by practice and experience: The FDS Academy and its seminar range.



One of the 14 Honda motorcycle models that are produced in Brazil.

Quality-duo for two-wheelers

For more than 30 years, Honda has been manufacturing light-weight motorcycles in Brazil, and for the same time, Simrit has been its preferred partner for sealing components. Both companies have the same quality demands and the matching quality management.

Light-weight motorcycles such as Honda's CG 150i Titan are much sought-after in Brazil. In rural areas, they are a preferred method of transport, and they are also perfect for avoiding traffic jams and quickly getting from A to B in the huge country's urban centres. Light-weight motorcycles of up to 150 ccm are also affordable for most citizens, and therefore constitute a true mass product.

6,000 motorcycles per day

As global market-leader for such motorcycles, Honda has recognised the market's potential at an early time. Since the early 1970s, the Japanese company has been active in Brazil. Since 1976, they have been operating manufacturing plants in the country.

In Manaus, 8,500 Honda employees build 6,000 units per day. The historical threshold of 10 million Honda cycles was reached in 2007. In 2008 alone, 1.45 million Honda machines were sold in Brazil. With 462,000 units, the CG 150i Titan is the clear winner in this race.

Continuous investment in new technologies is the basis for Honda's market-leading position. The Amazonia production site is ISO 9002 and ISO 14001-certified.

The suppliers must, of course, comply with the same quality requirements. Therefore, the company has been cooperating with Simrit for 30 years where sealing components are concerned.

From starter to hub cap

Today, Simrit delivers 16 different sealing products for the Honda cycles manufactured in Brazil – 15 radial shaft seals and one O-ring. Simrit's seals are used in the motor, gears, the clutch and on the wheels. The seals secure all important cycle components against leakage. Among others, they are used for the kick start and starter motor, gear and

drive shafts, the front brake unit and the rear hub caps.

Performance and environment

The sealing components delivered by Simrit are not only important for motorcycle performance, but also for preventing environmental damage due to oil leakage or emission of harmful substances. By the way, the plant is situated in a region that is special in ecological respects: in Manaus, at the heart of the Amazon jungle, where the Rio Negro and Rio Solimões meet. The free zone of Manaus is currently home to more than 400 companies.

In brief



- Honda has manufactured more than 11 million light-weight motorcycles in Brazil since the 1970s
- Honda's Manaus production site is ISO 9002 and ISO 14001-certified
- Simrit has been Honda Brazil's sealing component partner for more than 30 years
- Honda buys 15 different Simrings and 1 O-ring type



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Maintaining the correct tension for "crawlers"

Crawler mechanisms are often required for agricultural machines. The "crawler", however, can only work properly under the right tension. Simrit, the long-term sealing and vibration technology partner of agricultural machine specialist Claas, has now developed a new, robust, very low-maintenance belt tensioning cylinder with a long service life together with its client.

For a high yield of grain and crops, farmland must be treated with care. At the same time, only state of the art agricultural machine technology can guarantee food supply at acceptable prices.

Tension between retention of fertile soil and highly mechanic machine technology increases. Global technology leaders for agricultural machines, such as family company Claas, therefore continually try to develop solutions for agricultural

work machines that best combine soil compatibility and efficiency. This is a task that cannot be solved without vibration and sealing technology precision parts used in many components of combines and shredders.

Claas was able to meet the challenges named above with the help of several decades of development performed in cooperation with Simrit.

Wheel-driven harvesting machines cannot be used on wet soil due to the high

weight of these huge machines. Crawlers are the best means for this. With their larger contact surface, even heavy weights can be "distributed" over a



In brief

- Crawlers are prerequisites for many agricultural harvesters
- Simrit developed an integrated, compact belt tensioning cylinder for Claas
- The belt tensioning cylinder requires little service effort
- Consistent reduction of the number of components from 5 to 1
- Optimised system development for operation



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A Simrit belt tensioning cylinder is integrated into the Claas Industrietechnik TerraTrac crawler.

Five components became one: The integrated build of the compact belt tensioning cylinder reduces not only the logistics effort.





Crawler machines are less harmful to farmland and thereby increase yield.

wide area. This greatly reduces soil compaction. Another advantage of the current Claas TerraTrac crawlers is that they are suitable for roads as well. Time and costs are saved by dispensing with the time-consuming process of transporting the combine on a transport vehicle.

Low maintenance effort

Details are decisive for crawlers as well. They will be useless if the belt tension is wrong. The crawler belt therefore must retain its tension in the long run and without continuous maintenance, no matter if outside temperatures are high or low, tropically moist or dry as on the European continent.

This is where the really good crawler manufacturers come in. With the jointly developed belt tensioning cylinder, Claas is also one of the best where service life and maintenance efficiency for crawlers are concerned.

While early solutions consisted of a common hydraulic cylinder and an additional hydraulic accumulator, as well as a larger number of connecting hoses – all of which were attached separately

to the crawler – the accumulator is now integrated into the cylinder. The nitrogen-filled gas room exerts continuous pressure onto the oil chamber and thereby ensures that the crawler belt has the right tension (see figure).

This integrated build completely dispenses with hoses, and therefore also with their ever-present failure-risk, e.g. from tearing. "The cylinder is designed in an integrated way, so that no dirt can enter, no hoses can tear and the accumulator cannot break off. This makes the component much more robust and lowers maintenance requirements," explains Mr. Obermeier-Hartmann, Crawler Project Manager at Claas.

High Reliability

The cylinder has a gas pretension of 80 bar. To ensure that the crawler belt always has the right tension, the belt tensioning cylinder is operated at 105 bar. The compact design also clearly simplified installation and the integrated build leads to zero permeation and minimises system inertia. Additionally, the system's reaction time was increased.

The integrated build of the compact belt tensioning cylinder also reduced logistics expenses by 50%. "We have been cooperating closely with Simrit for anything from the technical concept to the finished product for a very long time. We know that we were always able to completely rely on Simrit's team," Mr. Tomasevic, Claas Corporate Procurement Manager praises the cooperation of the two family businesses.

Smooth solutions for rough environments

Doppelmayr bulk and general cargo systems cause only low CO₂ and fine dust emissions even under extremely rough environmental conditions and are low on energy consumption. A sealing solution developed specially for the cable-guided wheels in a joint effort between Simrit and Doppelmayr Transport Technology makes an important contribution to this.

Transport of large amounts of stones or landfill material over long distances and in inhospitable environments is a challenge for man, material and environment. The solution developed for this is the RopeCon® system, provided by ca-

ble railway technology specialist Doppelmayr. The company developed bulk and general cargo transport systems on cables, currently the only one of its kind in the entire world. They are easy on the environment, even though the environ-

ment is hardly easy on them.

In the extremely rough areas where they are used, dirt and moisture are everywhere and can quickly disable high tech transport technology if no provisions are made beforehand to prevent it. Ad-

RopeCon® for gold ore transport in Papua New Guinea.



Cable railway technology for many applications

The use of cable railway technology is not limited to transporting skiers and mountain hikers. Austrian company Doppelmayr considers passenger cable cars an important business area, but the company, which is headquartered near Bregenz at the Bodensee not only provides "fun on the mountain" but also offers innovative solutions for transporting bulk and general cargo by cable-railway technology.

vanced technology on a large scale must be accompanied by advanced technology on a small scale – for example where seals are concerned. The best is just good enough here, and so it is only a matter of course that Doppelmayr, technology leader in this area, buys its high-tech seals from Simrit – market and technology leader for sealing and vibration technology.

"Doppelmayr systems must be able to deal with Siberian cold, the tropical climate of Papua New Guinea and Jamaican bauxite dust equally well," says Herbert Trieb, technical director at Doppelmayr Transport Technology GmbH. "Therefore, we were looking for a solution for low-friction bearing seals with a long service life for the cable-guided wheels. This way, we avoid downtimes due to bearing damage caused by moisture and dirt and keep pollutant emissions of CO₂ and fine dust at a minimum."

Customized seal

In a joint development project, Doppelmayr and Simrit developed a seal optimised just for the customer's applications. It is built similarly to a Simmerring and consists of three sealing lips (two axial and one radial ones).

The sealing lips overlap to enable best low-friction and low-wear operation of the system. The sealing lip alignment reliably prevents water, dirt and dust from entering and reaching the bearing point. The seal is preceded by a sheet labyrinth that may also be left out in less difficult environments. The construction's design also included best lubrication. Klüber is the Simrit group's prestigious lubrication expert. Their Lube&Seal cooperation has been researching the best interaction between seal and lubricant for years.



The features of the customized seal are adapted exactly to the system.

Together from plan to series

A RopeCon® system may use thousands of guide rolls, each of which is characterised by low wear and pollutant emission, low energy consumption and a long, maintenance-free service life (up to 40,000 h). To be able to comply with such requirements, the seal must be perfectly adapted to the complete system. The sealing manufacturer not only needs

to understand the requirements of the system manufacturer, but also be able to efficiently and quickly implement them with his materials and design expertise as well as product range. Simrit offers this complete package. This is the reason for the close partnership between Doppelmayr and the sealing specialist from project development to the final product delivery.

In brief



- Doppelmayr requires low-friction wheels with a long service life for RopeCon®
- Together with Doppelmayr, Simrit developed a seal for use in rough environments
- The features of the seal are adapted exactly to the system
- They have a development partnership from product design to series production



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Hydraulic motors under pressure

Users of mobile machinery place higher and higher demands on their reliability and performance. This implies continually increasing requirements for motor manufacturers and the sealing specialist, who must warrant higher and higher pressure capacities.

Hydraulic motors are used as a special drive in many mobile machines, ranging from excavators to combines and forklifts. Since their launch in 1958, several million hydraulics motors have been sold. Poclain Hydraulics has improved them continually and designed them for a variety of possible applications.

Technical progress has permitted us to expand displacement by 75%, increase torque by 55% and the speed limit by 20%. The current service life is three times that of 40 years ago, and reliability has improved tenfold. Performance could also be much improved, partially due to progress in the sealing element area that lead to a reduction of internal and external leaks.

Poclain Hydraulics
MS05 hydraulic
motor.



Simmerrings for high pressure

Here, at the latest, Simrit comes in. BAHD-build Simmerrings intended for high pressures are used, for example, to reliably seal the central shaft passage in MS series motors. The pressure loads measured are usually between one and two bar. Under extreme conditions, pres-

ures of up to 50 bar can arise. Even these high loads will, thanks to the reliable Simmerrings used, not cause any leakages. In many cases, Nitrile Butadiene Rubber (NBR) is most suitable. This material was constantly developed further by Simrit, so that there is now a special NBR for such seals. Continuous fur-



ther development of NBR was based not only on Simrit's materials experience and innovation, but also on the constructive partnership with Poclairn Hydraulics, which enabled a very positive exchange of ideas.

Reliability and service life

The efforts of Poclairn Hydraulics developers were generally targeted at improving the reliability and service life of those mobile machines where the MS series hydraulic motors are used. Additionally, integration of electronics and

mechanics (mechatronics) plays an important role. Customers for construction and agricultural machines, as well as for forklifts, increasingly often require solutions where the motor, sensors and actuators of shovels, swivel arms or rotating arms are controlled by a central computer.

Rotating swivel arm

One of the many customers for Poclairn Hydraulics motors is German-French group of companies Mecalac-Ahlmann, a global manufacturer of mobile machinery.

The turntable of the multi-function excavator's completely rotatable arm is moved by a type MS05 hydraulic motor. The swivel arm can perform up to 6.5 turns per minute. The motor piston area is subject to pressures of up to 230 bar, which may then cause the extreme pressures of up to 50 bar at the peripherals. This is where the Simmerings are located.

Such framework conditions require the very best of sealing technology and offer another area of application for a sealing specialist like Simrit.



Mecalac multi function excavator. The arm's turntable is moved by a Poclairn hydraulic motor equipped with Simrit Simmerings.

In brief



- Simmerings for hydraulic motors must be able to cope with high pressures
- The requirements regarding service life and reliability keep increasing
- The quality expected of motor seals today can only be achieved by innovations in the areas of materials and construction



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Section of a Hinni hydrant: Simrit supplies a PU formed part.

Potable water grid control system

A smart control system integrated into the in-house hydrants is a completely new possibility for sustainable business offered by Swiss company Hinni AG. Simrit provides its hydrolysis-resistant polyurethane material (PU) to increase the control system's special features.

Clean potable water is a scarce and therefore precious resource in our world. Sustainable handling is therefore required from ecologic as well as economic points of view. The widely ramified water supply pipeline systems on the other hand do nothing to make the handling of potable water any easier. Leaks are usually not noticed at once, and sometimes not at all. This causes water loss of up to 25%.

"Common water supplier measures such as leakage recognition by temporary listening devices at the hydrant certainly lead to savings, but they are already 'dated' a day later. Furthermore, the data must be read and collected on site. This makes it less current and causes much higher costs. Much more efficient work would be possible 24/7 these days, if smart sensor technology, processing of measured values and

radio transmission were used," says D. Jermann, Development Manager of Swiss hydrant specialist Hinni AG. The Biel-Benken company offers Lorno, a control system for public potable water grids. It enables comprehensive leakage monitoring of water line systems and hydrant fittings. Unauthorised water withdrawal and a safe operational state of the hydrants in the supply area can also be monitored. Filling level monitoring indicates flooded hydrants, preventing damage from freezing hydrants.

Perfect: hydrolysis-resistant PU

At the core of Lorno, there is the so-called hydrophone, a sensor in the main hydrant valve. This hydrophone takes up the sound waves right in the water to return highly accurate measured values, independently of the pipe material. When the noise level deviates from the reference frequency for several hours, a leakage is detected and indicated. This message is automatically sent to the responsible party by text message or email in the monitoring system.

The hydrophone is a particularly innovative element of the Hinni control system and of course also requires innovative sealing solutions. While the hydrant industry has long used elastomers such as NBR and later EPDM, as well, as sealing materials, the last years show a trend towards thermoplastic PU, which has very good wear and tensile resistance and high breaking elongation. The material also offers high ozone and oxidation resistance, great dampening behaviour



The innovative PU formed part – Simrit's sealing solution shows high wear and tensile resistance.

With Lorno, Hinni offers a control system for the public potable water grid.

and an enormous resistance to tear formation and growth.

With its hydrolysis-resistant PU, Simrit is currently the only manufacturer on the market offering a material cleared for use with potable water as well. It can be used to manufacture standard seals as well as many formed parts for application-specific solutions.

Different PU formed parts

For the Hinni Lorno system, Simrit delivers a PU formed part connecting the hydrophone in the main valve described above to a locking cone, thus enabling measurement in the water. The formed part can be rolled up so that it can follow the movement of the double lock in the hydrant. To ensure that this rolling up can be performed easily, the cap geometry is perfectly adapted to it. Additionally, Simrit also supplies main valve seals and drainage seals made of pure PU or metal covered in PU as customised formed parts for the Swiss hydrant specialist.

These parts were also accurately adapted in size to the sink marks. Due to the great features of this hydrolysis-resistant material for the potable water supply area, Hinni can assume much longer maintenance intervals for its hydrants. The related lower operating costs also constitute an advantage for water suppliers, for whom using the new technology will pay off faster. The true winner, however, are people in general, since their elixir of life is being treated with more consideration.



In brief



- Continuous and smart supervision of the public potable water grid
- Hydrolysis-resistant PU part as central hydrant sealing solution
- Much longer maintenance intervals due to the great resistance PU has to tear formation and growth



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A silent advantage

Hydro accumulators are the best components for mitigating or even removing undesired energy surges elegantly. Simrit offers a wide range of these components and high competence at designing diaphragms. Lift Components Bochum GmbH (LCB) relies on this know-how for developing new pulsation dampeners for their hydraulic lifts.

Best passenger comfort is expected not only in passenger trains and cars these days, but also in passenger lifts in residential and commercial buildings. In hydraulic lifts in particular, increased performance of the pumps pressing oil into the hydraulic cylinders is a great advantage for the lift's range of applications. At the same time, the manufacturers of the respective aggregates and cabins must consider the "side effects" of this higher performance and remove them by using state of the art pulsation dampening methods. This is mainly a matter of comfort.

Pulsation dampening concepts

LCB's developers deal with these problems each and every day. The company mainly manufactures hydraulic cylinders, hydraulic aggregates, construction sets and cabins for lifts, but also sells complete lift systems. "The lift cabins are built at increasingly low weights and the

pumps used have more and more power," says Andreas Gadischke, Manager of LCB. Without any counter-measures, this increased performance will cause stronger vibration of the lift cabin and often also in the building.

This is directly apparent by vibration of the passenger cabin and the respective resonances. "This negative side effect of a higher transport performance is accepted by fewer and fewer customers now," Mr. Wassermann, LCB Procurement Manager, relates his experience. The customers' wishes, controlled by the comfort demands of lift operators in residential and commercial buildings, require new concepts in pulsation control for pumps.

LCB realised that the dampening elements "common for the industry" that have been used for years and take the form of a tube with two dish ends are no longer sufficient to meet the rising comfort demands of lift users.

Technology surge by hydro accumulators

LCB found its solution in the form of hydro accumulators with a maintenance-free Simrit diaphragm. The hydro accumulator units are available at different sizes and were tested in extensive test bench runs and field tests. They proved suitable as pulsation dampening elements for a new technology generation of hydraulic lifts.

"Using the seal and materials competence of Simrit, LCB was able to be the first on the market to provide extremely silent lift systems and lift drive units. This is a clear technology advantage that we hold over our competition," Thomas Lyssewski, who supports the project as a Simrit sales engineer says happily.

He also refers to the quick project development: "Only one year passed from the first idea to the first positive feedback from the field."



In brief

- Increased pump performance requires new pulsation dampening methods
- Simrit hydro accumulators replace the tube with two dish ends that is "common for the industry"
- Together with Simrit, LCB was able to achieve a clear technology advantage on the market



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Image to the left: Hydro accumulator with maintenance-free Simrit diaphragm.

Image to the right: With the Simrit hydro accumulators, hydraulic lifts of the new generation float up and down silently.



HNBR bellows close a gap

Simrit has long been offering a comprehensive range of bellows made of poly-chloroprene (CR) for a temperature range of $-40\text{ }^{\circ}\text{C}$ to $+140\text{ }^{\circ}\text{C}$. For usage conditions above $+100\text{ }^{\circ}\text{C}$, however, the materials previously used in this temperature range – EPDM, silicone or FKM –

lead to limitations regarding one or another parameter. The 60 HNBR 288460 material now closes this gap.

Bellows from this material are used in applications for which the PVC material is not sufficient due to temperatures rising above $100\text{ }^{\circ}\text{C}$ and where the materials EPDM and VMQ cannot be used due to incompatibility with the contact medium or where low temperature requirements prevent the use of FKM.

Areas of application for HNBR bellows outside of the vehicle industry include components subject to high temperatures or aggressive environmental media in mobile machines, transport technology and hydraulic and pneumatic cylinders.

HNBR bellows for components used in the high-temperature range.



In brief

- Bellows for applications at temperatures above $100\text{ }^{\circ}\text{C}$
- Can be used in components with high temperatures and aggressive environmental media



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Compact industry piston accumulator for up to 350 bar

If devices such as hydraulic pumps and hydro motors are to be operated in the most economic way, or if the front-mounted bucket of an excavator is to be kept stable even if the excavator is moving over uneven ground, industrial piston accumulators (hydro accumulators) are the most suitable energy storage. The component called accumulator is also very well suitable for maintaining a constant pressure, as leakage oil compensation, for volume compensation in closed circuits or for weight compensation.

Also, hydro accumulators are an indispensable safety element for emergency supply in case the primary power supply

fails. Industrial piston accumulators generally consist of a liquid and a gas side separated from each other with a gas-tight piston.

The liquid side is connected to the hydraulic system. When the pressure rises, the gas volume enclosed on the gas side is compressed and liquid enters the piston accumulator. When the pressure on the liquid side drops, the compressed gas expands and displaces the stored liquid into the hydraulic system.

This functional principle enables storing the volumes required for covering peak loads in the accumulators during low-consumption times or a standstill. Thus, a pump only needs to be designed

for average consumption and is, therefore, much more economic.

Easy assembly and disassembly

The newly developed Simrit industrial piston accumulator is kept as small as possible in terms of weight and installed space. State of the art technologies and high-tensile materials were used to develop a piston accumulator offering a very high specific performance at a maximum operating pressure of 350 bar.

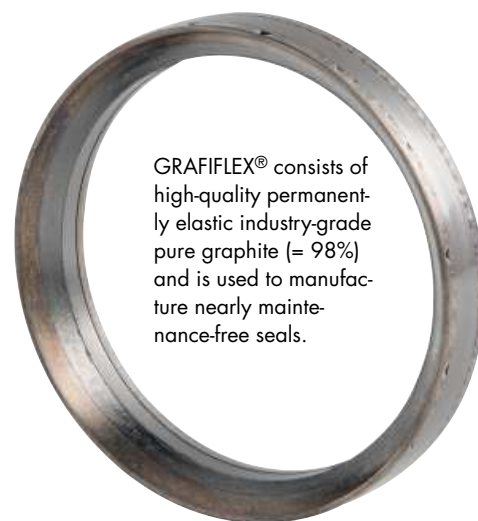
As a standard, the hydro accumulators are produced with an accumulator volume of two, four and 5.7 litres. Due to their low weight and compact build, they can also be assembled and disassembled

Stuffing box packings for greatest tightness requirements

Where a minimum leakage rate must not be exceeded during the time of operation of fittings, pumps or valves, stuffing box packings made of pure expanded graphite is the medium of choice. Simrit offers packings made of this material, called Grafiflex, for use in fittings and valves in the power plant area, natural

oil exploration (oil rigs), refineries, mining and ship construction. The seals are resistant to hot and feed water, vapour, heat carrier oils and many other media. The material is delivered in the form of form-pressed rings with a density of 1.4 to 1.85 g/cm³, as well as in the form of sheet material (with or without print) for rolling your own rings for repairs. Grafiflex is highly chemical- and temperature-resistant. Even after sudden changes in temperature, there will be no cold flow, shrinkage or aging of the material. The stuffing box packing remains elastic at a surface pressure of up to 200 N/mm² even at these temperatures.

Construction-related gap widths of up to 0.3 mm can be bridged easily. Larger gaps can be sealed with packing rings that have tubular springs integrated in their corners. In a power plant application for sealing control valves within a turbine with the environmental medium vapour (temperature 450 °C, pressure 177 bar), using Grafiflex packings could increase the service cycle from two



GRAFIFLEX® consists of high-quality permanently elastic industry-grade pure graphite (= 98%) and is used to manufacture nearly maintenance-free seals.

months (for the competitor's product) to twelve months. In particular, Grafiflex rings fulfil the purity requirements for seals for power plant fittings in which the ratio of soluble chlorides must be below 20 ppm.

In brief

- Grafiflex seals are resistant to hot and supply water, vapour, heat carrier oils and many other media
- Even after sudden changes in temperature, there will be no cold flow, shrinkage or aging of the material



Any questions or suggestions?
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bled easily and are therefore very service-friendly.

With standard seals, they can be used in a temperature range of -20 °C to +80 °C. Higher temperature requirements can also be met with customised sealing solutions.

Industrial piston accumulators for economic use, comfort and safety. With state of the art materials, they can be built in a very compact way while maintaining high performance.



In brief

- Industry piston accumulators (hydro accumulators) are ideal for energy storage
- The newly developed Simrit industrial piston accumulator is kept as small as possible in terms of weight and installed space.
- At a maximum operational pressure of 350 bar, it offers a very high specific capacity.



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Optimised components with FEM

With the finite element method (FEM), functional safety of components in applications can be evaluated. For hinge axis bellows, Simrit was able to use FEM simulations to optimise design and increase the service life by approximately 10% as compared to the original design.



In brief

- Simulations according to the finite element method (FEM) can be used to exactly describe materials behaviour
- The optimised Simrit materials model can be used to design elastomer components so that tension and expansion will be minimised
- Simrit was able to use FEM simulations to greatly increase the service life of joint-axis bellows



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For solving complex problems of statics, solidity, dynamics and thermodynamics, industrial product development uses the finite element method (FEM) as a calculation method. This procedure can be used to describe almost any mechanic question well mathematically, in particular regarding non-linear issues caused by complex materials behaviour or contact problems. Since the FEM analysis can be used to achieve a high product quality at acceptable development times, it is an important aid in developing technical elastomer components.

Simulations with FEM models that exactly describe materials behaviour therefore gain more and more importance. Among others, such models can be used to design the topology and shape of components under mechanical strain in a way that will cause as little distortion and tension as possible. For this, Simrit devel-

oped an optimised materials model that correlates well with the experimental data and retains its validity even in case of large material distortions (>150%) (see graphics on page 19).

Process optimisation

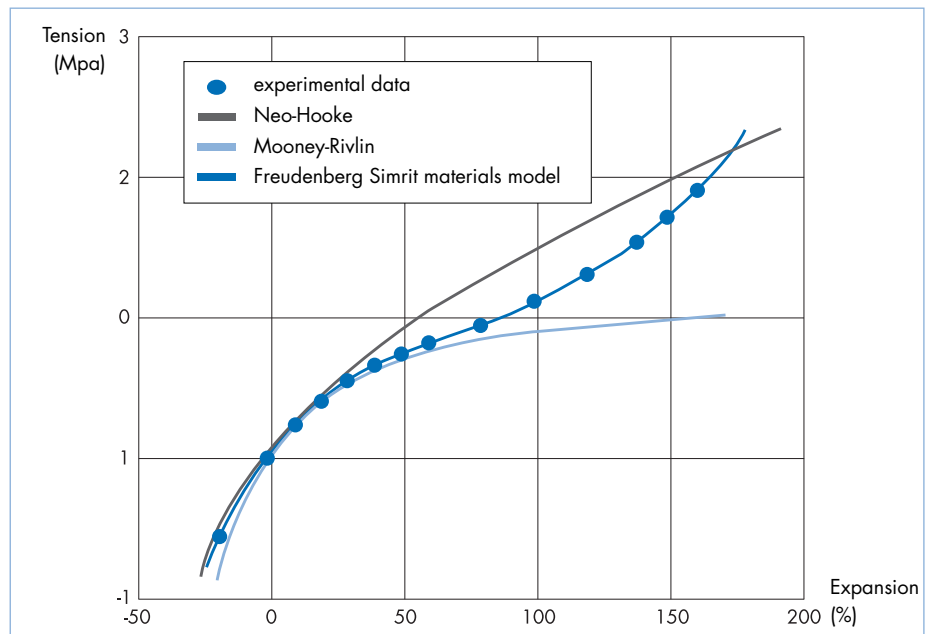
For manufacturing precision perfect components, simulation of filling processes is an important aid. For example, the filling front line, position of junction seams or pressure requirements can be calculated as a basis for selecting the injection moulding device best suited for each case.

Possible error sources, such as air inclusions, can be recognised and removed early this way. Where universal flow simulation programmes are combined with optimised materials models to describe linkage kinetics, the scorch index (which characterises the flow period,

Comparison of different materials models to experimental data regarding tension-expansion-behaviour. The best materials model is offered by Freudenberg Simrit.

The finite element method (FEM) puts the quality debate into motion: Elastic protective bellows for drive shafts.

Tension-sealing-ratio



meaning the time until the elastomer has linked) and linkage density for injection moulding of elastomer components can also be calculated.

This is important, because an elastomer part is subject to shear and tensile deformation between the filling process in the injection casting machine cylinder and the time when it reaches its final position in the tool. Simulation needs to consider high speed gradients at the tool edge and thin temperature threshold layers. This not only requires special software, but also considerable calculation effort for describing the complex three-dimensional flow processes. The advantage of all process simulations is that parameter

changes and optimisations at the computer can be performed and verified within a few hours or days. The new insights can thus be used for product or process design even at an early stage of development.

Service life increased by 10%

Successful use of FEM calculations for optimisation of component design can be illustrated at the example of bellows. Bellows are, for example, used for sealing the joint lubrication of axes that must permit large angle movements. In addition to complying with elasticity requirements, development efforts are mainly targeted at a long component service life.

The following framework conditions must be considered: Loads acting on the axisymmetric component are not axisymmetric themselves. Therefore, calculations need to consider a combination of axial and transverse loads. Where the simulation shows peak tensions in the component, these can be reduced by suitable adaptation of the component design or, partially, by optimising the material. Changes of the component design in particular have a great effect on tensile and compression loads. Simrit was able to use FEM simulations to greatly increase the service life of bellows. It is now approximately 10% higher than that of the original design.

By simulation distortion, we can see what would otherwise be invisible: Tensions and expansions at the bellows

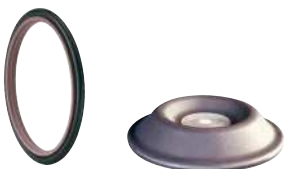


Going for gold

"With the new COP 3038, Atlas Copco has launched a masterpiece of innovative rock drill technology onto the market: double the blow frequency with the same energy output, and with 10% fewer parts. To ensure this hammer drill frequency is perfectly maintained, we use sealing elements from Simrit. The world's largest product range offers the best solutions for our diverse applications – from hydraulic seals to diaphragms."

Lasse Persson
R&D Manager Rocktec Division
Atlas Copco, Sweden

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