

simrit® insight.

02 | 2005

The magazine for Simrit customers

Simmerring PTS
A broad range
of applications

Low temperature PU
Cool seals

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**Simrit seals in the
Three Gorges dam**
A colossal infrastructure project



Editorial

Dear Customers,

Several months have passed since the Hannover Trade Fair; nevertheless, I would like to begin this edition by thanking you: Thank you for the enormous amount of interest in our products and for all of the numerous, fine discussions at the fair. And, above all else, thank you for the wealth of suggestions that you made to us - and continue to make on a daily basis. You can be certain that each of these suggestions is taken very seriously by our product managers and developers, and checked for their implementability.

In this edition we also introduce an abundance of Simrit innovations. Beginning with coated ISC O-Rings on to Simmerring® PTS with a vulcanised PTFE sealing collar all the way to the new KL and VL hydromounts. In addition, there is the new low-temperature material 92 AU 21100, which allows for the manufacture of reliable sealing systems with a temperature range from -50 to +100 degrees Celsius. This innovation proves once again our expertise in materials, which goes back more than 50 years (in regard to polyurethane, for instance). By the way, none of the innovations presented in this magazine are simply laboratory prototypes - they will be available for delivery soon. The numerous practical examples in this issue underscore that.

Our cover story reports on one of the most colossal infrastructure projects in the history of mankind: the Three Gorges Dam in central China. Inside of this immense technical machinery are sealing products from Simrit; inconspicuous yet vitally important and efficient parts (Page 6).



Dr. Jan Gupta,
Simrit® Europa

The cover story provides me with an opportunity to point out the huge amount of importance that Simrit ascribes to the Asian market. Already in the early 1990's we, together with our Japanese partner NOK, were present in China with several plants. Since mid-2005 we have our own site, staffed with with Simrit specialists, located just outside of Shanghai. Just as we have regularly done in the past, at the end of November 2005 we will be represented at the PTC Asia in Shanghai.

Our partnership with NOK in Japan goes back almost five decades. In 2000 we founded, together with NOK and our Indian partner Sigma, a joint venture in India and have since continued to further develop it. (Page 9).

Since the beginning, Simrit has made "Local Globality" its motto - for the benefit of our customers. You can be certain: wherever you are, with Simrit you will find a competent specialist nearby to contact for all of your seal and vibration control problems. With this in mind, I would like to wish you productive talks and a lot of fun reading this issue of Simrit insight.

Sincerely,

Dr. Jan Gupta

Editorial information

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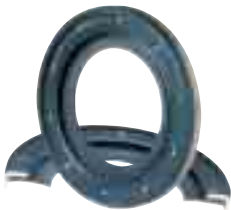
Cover Story

The Three Gorges Dam is the greatest geographic infrastructure project in the history of mankind. These Chinese characters stand for three (san) and gorges (xia). The Yangtse River will be backed up for a length of 660 kilometres. The hydroelectric plant will generate 85 billion kilowatts of electrical power annually. Within this immense technical machinery are sealing products from Simrit that perform a show of strength; inconspicuous yet vitally important parts.



Contents

News	4
Cover Story	6
Simrit Global	9
Fields of Application	10
Simmerring®	12
Vibration Control	14
ISC O-Ring	16
Materials	18



With the newly developed Simmerring® PTS design type, Simrit reacts to the continuously increasing demands in machinery manufacturing



Simrit hydromounts resolve the conflicting goals of vibration reduction and structure-borne noise insulation

Change of leadership

New directors



As of July 1, Christian Favetto (43) has assumed duties as the successor to the late Josef Jäger, who recently passed

away, as Regional Sales Director for France-BeneLux-Iberica. Favetto, previously national sales manager for France, has a graduate degree in economics and has been with Simrit for 18 months. Prior to Simrit he was employed for 18 years by a leading company in the field of seal technology, in his last position as sales manager for France, Africa and India. Favetto is married and has two children.



Starting 1 October 2005, the new Regional Director for Germany will be Ralf Schmid. Schmid (40) has a master's

degree in economics, is married and the father of two children. He has performed various management functions, both domestically and abroad, in the areas of marketing/sales, logistics, controlling and purchasing at a leading company in the chemicals industry. Most recently he was responsible for the area of brake fluid and refrigerants in the automobile industry and commercial markets in Europe.



From left to right: Dominique Roche (Purchasing, Borg Warner), Patrice Lagrange (Quality Assurance, Borg Warner), Jean-Luc Paris (Simrit France), Alain Schmitt (Product Marketing, Meillor Cylinder Head Gaskets), Serge Soulier (Quality Assurance, Borg Warner), Thomas Gropp (Purchasing, Borg Warner)

Two awards for Simrit

High product and delivery quality

For the fourth time, Simrit has been recognised with the John Deere Award. The evaluation criteria for the honour, awarded by all John Deere plants, are based on the areas of purchasing, QA, engineering, logistics and spare parts. John Deere recognised Simrit above all else for its superb pro-

duct quality and delivery performance. Furthermore, Simrit also received the "Supplier Quality Award 2004" from Borg Warner for excellence in quality and particularly for service. Simrit supplies Borg Warner with, among other things, Meillor cylinder head gaskets and membranes.

Simrit Tech Day in Kolding

Hearty response

Danfoss and Simrit - both companies have been partners for decades. Yet, although the acquaintance is deep and goes back many years, the Simrit Tech Day on 21. June 2005 at Danfoss in Kolding (Denmark) showed that there is still a great deal of interest across a broad range of areas on the part of the developers, design engineers and purchasers at Danfoss. From the first presentation to the last, all seats in the conference room were taken. The materials, product development and product marketing experts expounded upon the fascination of modern elastomer materials on through to trendsetting products and manufacturing methods. They were also available for individual contact throughout the entire event day.

A personage

Josef Jäger †



Josef Jäger, Regional Sales Director for the France-BeneLux-Iberica region, born on 11. March 1955 in Weinheim, had made a

textbook career within the Freudenberg Group, in the course of which he held management positions in Germany, Belgium and then France. For years he battled his illness with the sort of courage that instilled respect in everyone. We will all remember Josef as one who worked tirelessly and was guided by his devotion to the interests of his company as well as his team. As a bridge between two cultures, he earned the highest regard.

Positive echo worldwide

Simrit: a magnet

Drive and fluid technology professional circles still speak enthusiastically about the Simrit appearance at the Hannover Trade Fair in April. More than 1500 trade visitors from all continents met at the bi-level stand in Hall 19 in order to inform themselves about new developments at Simrit. This outstanding number of visitors exceeded all previous years by a large margin! The guests were anxious to hear about the multitude of performance advantages that Simrit's product lines have to offer, as well as about the newest product innovations - from hydraulic mounts for reducing vibration and for insulating against structure-borne sound (report on pg. 14) on through to Simmerring MSS1+ Condition Monitoring. This particular innovation attracted the prolonged attention of trade visitors within the framework of the VDMA special programme "Condition Monitoring" in Hall 24. The live panel of experts, presented at the stand throughout the day, met with great approval for the quality of detailed information on Simrit product advances that they communicated.



Epidor and Simrit

50 Years of partnership for our customers

This year both Epidor and Simrit celebrate a common anniversary: the 50th year of their successful partnership. The Spanish firm, with its headquarters near

Barcelona and numerous other locations on the Iberian Peninsula, is specialised in sealing technology. Due to the high quality and large variety of products, Epidor

chose to enter a partnership with Simrit. It has developed into a strong bond from which, above all else, customers profit.

15th Simrit Innovation Forum on 17. November 2005

Personal attendance or via the Internet

Simrit's 15th Innovation Forum on 17. November 2005 should not be missed by anyone. The focus this time is on innovations in the areas of Simmerrings, elastomer compound and precision molded parts, Merkel hydraulic components, new elastomer materials, the new O-Ring coating concept, as well as Lube & Seal. Again at this forum you have the possibility to attend in person at the Weinheim municipal centre or via the Internet. All presentations will be simultaneously translated into English and French. Nearly 182 guests took part in the last event in March, approximately a

third of them online. Registration under: www.simrit.de/innovationsforum



Bellows product line

Expanded

Simrit has more than doubled its bellows product line offerings in the newest edition of the Simrit catalog. A total of 450 design types are depicted in the catalog - logically sorted and extensively described. The customer can choose from a comprehensive selection and expect rapid delivery. Simrit bellows are used in agricultural and construction machinery, in equipment manufacturing, in conveyor systems and electronics, as well as in medical and foodstuffs technology. At the Hannover Trade Fair in 2005 Simrit introduced a bellows that permanently seals cable guides.

Trade Fair and Events 2005

Month	Dates	Trade Fair and Event	Stand No.	City	Country	Link
November	17	15th Simrit Innovation Forum		Weinheim	Germany	www.simrit.de/innovationsforum
	22.-23.	FVA Information Conference of the Research Federation for Drive Tech.		Würzburg	Germany	www.fva-net.de
	28.11. to 1.12.	PTC Asia International Fair for Power Transmission and Control	Hall 3	Shanghai	China	www.ptc-asia.com

The largest hydroelectric plant in the world is being built on the Yangtse river: it can generate up to 85 billion kWh of electricity per year. The dam has a width of 2.3 km.



Simrit seals in the Three Gorges dam power plant in China

Multifunctional infrastructure project

Within the grand scale of the immense technical machinery to be used in the Three Gorges project in China, seals from Simrit are inconspicuous but absolutely vital parts.

Compact

- The hydroelectric plant at the Three Gorges dam can generate 85 billion kWh of electricity per year - 1/9 of China's current annual production.
- Each of the 26 generators, with 700 MW of nominal output, will exceed the output capacity of the Itaipu in Brazil - the largest hydroelectric plant in the world up until now - by more than half.
- Regarding the dam's metallic construction, a total of 116 hydraulic cylinders will be installed for the opening and closing of sluices and the gates of the 5-stage ship locks.
- The highest demands for dependability are placed upon the seals that are used.
- Since September 2001 Simrit has been providing Merkel chevron seal sets from the ES/EK line to the Chinese cylinder manufacturer.
- Simrit seals (U-Rings with PTFE back-up rings) are also used with the so-called servomotors which the energy technology specialist Voith Siemens Hydro from Heidenheim, Germany provides for the San Xia project.



More information under www.simrit.de/insight/titel
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The Yangtse river (in Chinese Chang Jiang = long river) is, with a total length of 6300 kilometres, the longest river in China and the third longest in the world. It flows through a quarter of the arable farm land and provides for a third of China's rural population. The Yangtse also serves as the lifeline between western China, which is rich in natural resources, and eastern China (Shanghai) whose economy is developing most dynamically.

In the past, the river has also brought hardship and death through disastrous flooding. A massive dam, hydroelectric plant and ship lock project should now, however, tame the river, bring water to parched regions,

improve ship travel, and - last, but not least - provide 1/9 of China's current total annual electrical power output.

Backed up for more than 660 kilometres

Between the major cities Chongqing and Wuhan, the mighty river forces its way through a 200 km long stretch between steep chasms in the Sichuan highland down to the central Chinese lowlands. Here the world famous "Three Gorges" (Chinese: San Xia) are located: Qutang, Wu und Xiling. It is at the outlet of the gorges that the world's largest dam and hydroelectric plant have been under construction in the last few



years. There are even more superlatives: the San Xia project in China is the largest geographic infrastructure project in the history of mankind. The Yangtse will be dammed over a length of 660 km and the project will, once completed, have forced more than 1 million people to resettle.

Along with the dam and the hydroelectric plant, the complex comprises an elevated canal and a series of ship locks. The dam is 2309 metres long and 185 metres tall. Upon completion the reservoir will have a volume of 39.3 billion cubic metres of water. Under normal conditions, the flow of water will be 16,000 cubic metres in per second; at a peak level expected every 10 years, a flow of 55,000 cubic metres per second is expected.

Every generator produces 700 megawatts

The hydroelectric power plant will produce 85 million kWh of electri-

city per year. Its 26 generators, each producing 700 MW of power, will exceed the capacity of Itaipu in Brazil - the largest hydroelectric power plant in the world up until now - by more than half.

Both the left and right halves of the dam have a length of more than 600 metres. The dam should also absorb the periodic high water levels, thus preventing flooding. The Yangtse is the most important trade route in the particularly populous regions of China. By channeling the gorge currents beneath the surface of the water, it is expected that ship traffic will increase by a volume 5 times today's rate. Ships of up to 10,000 tons should be able to navigate to the important port of Chongqing in the future.

And finally, the dam is supposed to provide the arid northern provinces with water.

Dam construction began in December of 1994. The last generators are supposed to go on line in 2009 and the artificial lake will reach its normal level by 2013. The entire cost of the Three Gorges project is estimated at 224 billion Yuan (approx. \$27.3 billion).

Seal technology from Simrit in the hydraulic cylinders

A total of 116 hydraulic cylinders will be installed for the dam's metallic construction in order to open and close the sluices and the gates of the 5-stage ship locks. These cylinders have a piston diameter of up to 650 millimetres and a stroke of up to 15 metres. This places the utmost demands on the reliability of the seals in use. Simrit proposed using the Merkel ES/EK chevron seal sets. These seals are in particular characterised by their extreme ruggedness in regard to



Merkel U-Rings with PTFE back-up rings are the seals of choice in the hydraulic cylinders for the power plant turbines delivered by Voith Siemens Hydro.

The San Xia project in China is the largest geographic infrastructure project in the history of mankind. The construction project encompasses a dam, high water level canal system, a hydroelectric power plant and ship locks.



Merkel chevron seal sets from the ES/EK line are used as seals in the 116 hydraulic cylinders for the opening and closing of sluices.

The Francis turbines from Voith Siemens are designed for a nominal power output of 700 MW each.



International Fair for Power Transmission and Control (PTC Asia)

Come visit us in Hall 3 of the International Fair for Power Transmission and Control (PTC Asia) in China's most modern trade fair centre in Shanghai. It is the most influential industrial trade fair in the Asian-Pacific region. The exhibition takes place between 28. November and 1. December 2005 in an exhibition area encompassing 80000 square metres in the new, completely booked-out Shanghai New International Expo Centre (SNIEC).



environmental factors and by their superb operational safety. The chevron seal sets and the corresponding design solution were consequentially specified for the project.

Approved by officials

Since September 2001, Simrit provides seals to the Chinese cylinder manufacturer. The first series of cylinders has already been accepted by the responsible public authority. Seals from Simrit (U-Rings with PTFE back-up rings) are also used in the so-called servomotors, supplied by the energy technology specialist Voith Siemens Hydro, from Heidenheim, Germany, for the San Xia project.

Positive experience

The servomotors are hydraulic cylinders for regulating the control device for a Francis turbine. As Voith Siemens Hydro found it had excellent experience with Simrit products in the past, use of the products in the Three Gorges project - where the smooth interoperation of parts from various suppliers is particularly critical due to the shear magnitude of the entire challenge - was imperative for reasons of reducing risk.

Enormous dimensions

The detailed data for the Francis turbines delivered by Voith Siemens reflect the gargantuan scope of the entire geographic infrastructure project: the diameter of the massive 416 tonne turbine rotor is 10 metres, the water flow per second is almost 1000 cubic metres, the drop of the water 80 metres.

Sujay Dutta, Simrit India

“Geographic proximity is important to our customers”

Simrit is, as a global technology specialist, at home in all markets of the world. Our column “Simrit Global” takes us this time to India, where Simrit has been present for many years with several Simrit Service Centres. In 2000, the joint venture Sigma Freudenberg NOK Pvt. Ltd. was founded, headquartered in New Delhi. There, Simrit insight spoke with Sujay Dutta, Sales Director for India.

Mr. Dutta, how long has Simrit been producing in India?

Production began in November 2001 and has been continuously increased in recent years. Together with the products imported from our European and Asian manufacturing facilities, we are able to offer our Indian customers an incomparably broad spectrum of sealing products.

Which products do you manufacture in India?

In our ultra-modern factory in Mohali, 270 km outside of New Delhi, we primarily manufacture Simmerrings, but also shock absorber seals and valve seals. We supply Indian customers as well as Simrit’s international customers in India.

In other words, you are both locally and globally oriented?

The geographic proximity is very important for our Indian customers. Our customers expect individual solutions to their technical and economic problems, provided by local specialists in their respective native language, as well as just-in-time deliveries from a local depot.

Which of these Indian customers are also worldwide Simrit customers?

A lot of them. Case New Holland, JCB, John Deere, Cummins, just to name a few.

How do you convey the global technical knowledge that your

employees have to your customers?

Mostly through personal talks. Many customers visit our factory and inform themselves there. Of course we also conduct seminars and courses, and attend trade fairs.

Which trade fairs in India are important for you?

Above all else it is the Imtex, India’s largest trade fair for manufacturers of components for machinery and equipment.

Are your specialists in regular contact with research and development at Simrit?

Yes, of course. By the way, when the joint venture was founded in 2001 the core team from our plant spent six months in Germany being trained. Our sales engineers

were also trained extensively by experienced Simrit engineers.

If you were to summarise the philosophy of Simrit India in a single sentence, what would you say?

As a technology specialist for seals and vibration control, we want to provide our customers with reliable long-term help in optimising their internal processes and bringing innovative, top-quality products into the market.

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Sujay Dutta



Simrit’s presence in India includes 3 service centres as well as the factory in Mohali.

Low-temperature PU material in mobile hydraulics

A forklift with real cool seals

With the newly developed low-temperature material 92 AU 21100, Merkel sealing systems from Simrit don't exhibit even the slightest leakage while in use under extreme conditions in STILL GmbH forklifts in a Danish refrigerated warehouse.

In mobile hydraulic systems, used in either naturally or artificially cold environments, demands on the sealing system utilised are exceptionally high. In some applications, excavators, snow-cats or mobile cranes are subjected to night-time temperatures as low as -50° . Even under these extreme conditions, full and immediate operability is expected of seals. Even the smallest leaks are unacceptable, both economically and ecologically. Even in artificial cold zones, such as filling systems for liquid hydrogen, where temperatures of -40° C can occur at filling nozzles, or in regard to special-use vehicles with hydraulic components in use in refrigerated environments, great demands are made in terms of the resistance to cold temperatures.

Mathias Burkert, Product Marketing Manager at Merkel Mobilhydraulik, cites as an example a forklift from the Simrit customer STILL GmbH which is



Compact

- A forklift at STILL GmbH is operated a maximum of 2 hours in a warehouse refrigerated at a constant -23° C.
- Due to the brief operating periods, the hydraulic fluid is just briefly warmed up before quickly cooling again.
- The sealing system, based on the low-temperature material 92 AU 21100, shows no leakage even under these extreme conditions.
- The PU material 92 AU 21100 has significant advantages compared to conventional materials used previously, particularly in regard to sudden shaft movements at low temperatures.
- Compared to standard materials, better sealing attributes are attained not only at low temperatures with 92 AU 21100, rather throughout the entire range of applications.

In mobile hydraulic systems, used in either naturally or artificially cold environments, demands on the sealing system utilised are exceptionally high.

operated in a Danish refrigerated warehouse and is equipped with Simrit seals based on the newly developed low-temperature polyurethane material 92 AU 21100. Seals made of this material are still sufficiently flexible even at temperatures down to -50° C. "92 AU 21100 is an example of Simrit's material expertise, which goes back 50 years in regard to their polyurethane experience.", says Burkert."

A material for extremes

Engineer Thomas Acksen, Director of Development at the Center of Components Cylinder of the STILL GmbH, and responsible for developing hydraulic cylinders in the Linde group, describes the application's ambient temperature: "After half an hour of operation, the temperature of the forklift hydraulic fluid is $+21^{\circ}$ C, while the ambient temperature in which the

More information under www.simrit.de/insight/anwendungsfelder

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vehicle is operated is a constant -23°C . Under these conditions, the vehicle is operated continuously for a maximum of two hours, whereby the hydraulic fluid and the components are only briefly warmed up before quickly cooling down again."

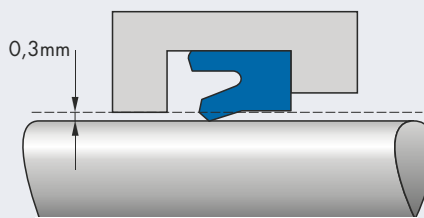
The existing sealing system, consisting of a dual wiper and shaft seal made of conventional polyurethane, proved to be unsuitable for the extreme conditions and constantly leaked. In response to this, Simrit delivered the previously mentioned seals in the newly developed low-temperature PU material 92 AU 21100. With seals and wipers made of this material the forklift now runs problem-free in the refrigerated warehouse. "The improvement was achieved solely by using seals made of this innovative material for our cylinders", states Thomas Acksen, adding "Nothing in the design of the guide cylinder was changed."

Test bench and field tests

"Together with Simrit, we tested the suitability of the material for extreme temperatures and optimised frictional behaviour with tests on the test bench and in the field", emphasised Thomas Acksen, continuing: "Principally, guide cylinders are subjected to great shear forces, and in the full extended position a sudden deflection can occur. In regard to this sudden deflection at low temperatures, the PU material 92 AU 21100 proved to provide significant advantages compared to conventional materials." Mathias Burkert explained the test sequence at Simrit: "The cold flexibility of the part is determined by deliberately deflecting the piston rod. The quicker the the seal can follow the deflection, the better its low-temperature behaviour. The loading frequency and loading speed play an important role here."

Dynamic calculations on a 3-D model

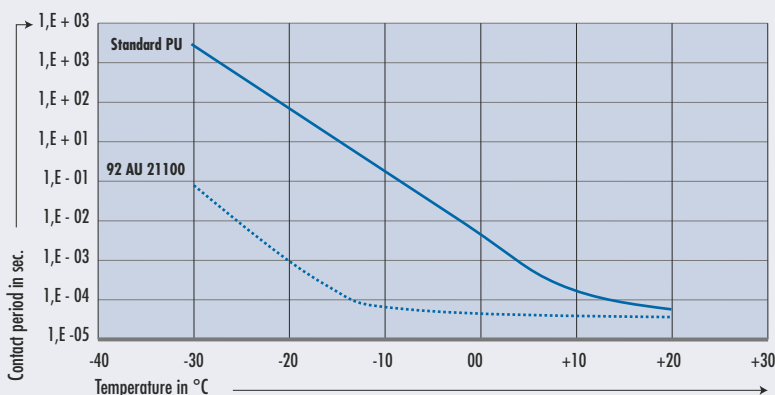
Material A:	Conventional material
Material B:	92 AU 21100
Geometry:	U-Ring
Dimensions:	50-65-10
Cylinder deflection:	+/- 0.15 mm in 0.2 sec.



Testing the cold flexibility of the seal

Contact period for touching the cylinder

at different temperatures for standard polyurethane 92 AU 21100



Contact period for touching the cylinder, for different materials

From -50°C up to $+100^{\circ}\text{C}$ always leakproof

The new polyurethane material 92 AU 21100 was especially conceived for use in low-temperature applications down to -50°C . However it is also suitable for standard applications up to $+100^{\circ}\text{C}$. What is distinctive about 92 AU 21100 is its exceptionally advantageous visco-elastic behaviour. This means that the soft parts of the material remain flexible across a greater temperature range and only grow stiff at very low temperatures. That way these seals immediately exhibit the necessary sealing qualities in operation, even at the lowest temperatures. Other important sealing traits, such as hardness and tensile strength, are not negatively affected; to the contrary - with the new 92 AU 21100, significant improvements compared to conventional polyurethane materials can be attained throughout the application range.

Simmerring PTS with vulcanised-bonded PTFE chevron seal

Modular design – broad application range

With the newly developed Simmerring® PTS, Simrit reacts to constantly rising demands in machinery and equipment manufacturing. Furthermore: completely new applications are possible with this innovative Simmerring.



This axial piston pump is a likely application for the new Simmerring PTS.

Simmerrings are proven machine parts which reliably fulfill the sealing function for an enormous variety of shaft designs over

countless thousands of operating hours. And, to keep it that way, Simrit engineers continue to develop Simmerrings further in order for them to also adapt to new ambient technical conditions. For instance, for new high-additive synthetic greases or even materials which are difficult to lubricate, which compromise an elastomer seal, especially when at the same time greater operating tolerances are being required from equipment. The only solution to these demands up until

now was offered by PTFE seals. PTFE's unique attributes, such as its outstanding high and low temperature resistance of -60°C to $+260^{\circ}\text{C}$, and its resistance to virtually all sorts of media, make this material indispensable for seal technology.

A broad spectrum of possible uses

In order to provide a reliable seal, Simmerrings made of PTFE require a helical return groove in the seal edge. This kind of Simmerring has

Compact

- A combination of a partially rubberised support housing and vulcanised-bonded PTFE chevron seal
- Secure static sealing even with pressure impact, up to at least 10 bar
- Leakage rate reduction by factor 14 compared to conventional PTFE seals

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been used very successfully for years to seal crankshafts. Under certain operating conditions, such as when under a pressure load or with reversing rotation of the shaft, the sealing performance is unstable due to the material-related traits of PTFE. With the new Simmerring PTS Simrit has succeeded in combining the outstanding advantages of PTFE with the functional characteristics of elastomers. With this, Simrit offers a Simmerring which is distinguished by its uncommon versatility in regard to the most varied demands. With the Simmerring PTS the PTFE seal collar is vulcanised-bonded on an elastomer.

Together with a partially rubberised support housing, the Simmerring PTS ensures:

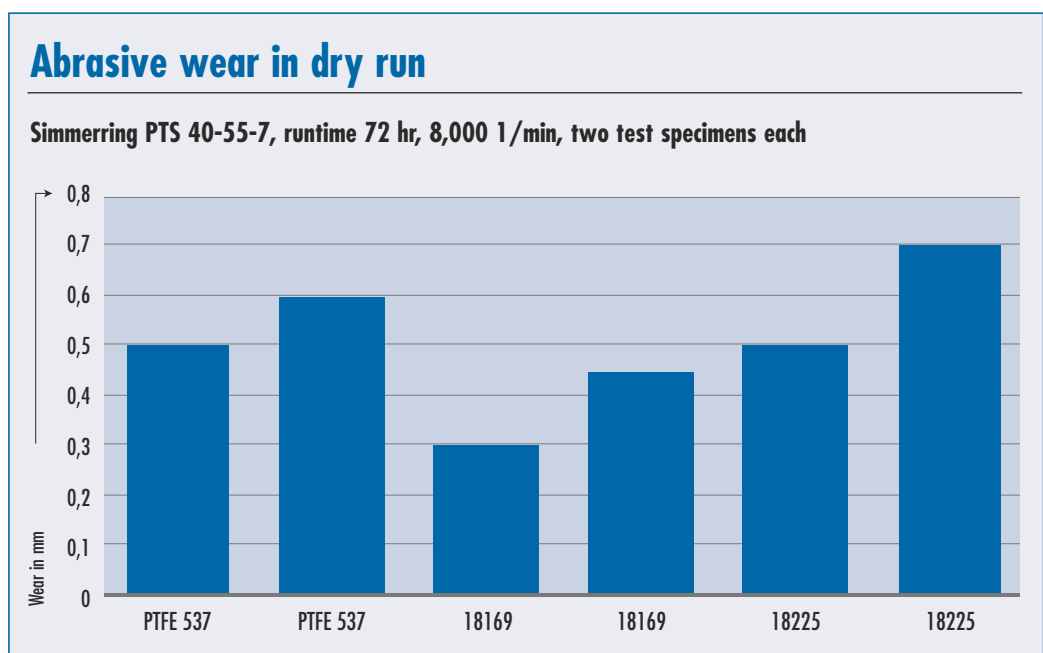
- The full functional advantages of PTFEs for the seal edge
- A stable, static seal effect, even if the pressure impact on the retainer seat reaches 10 bar
- Thanks to the rubberising of the support, no pasting in of the seal in the housing.

An integrated protective lip made of elastomer prevents external contaminants from reaching the seal lip.

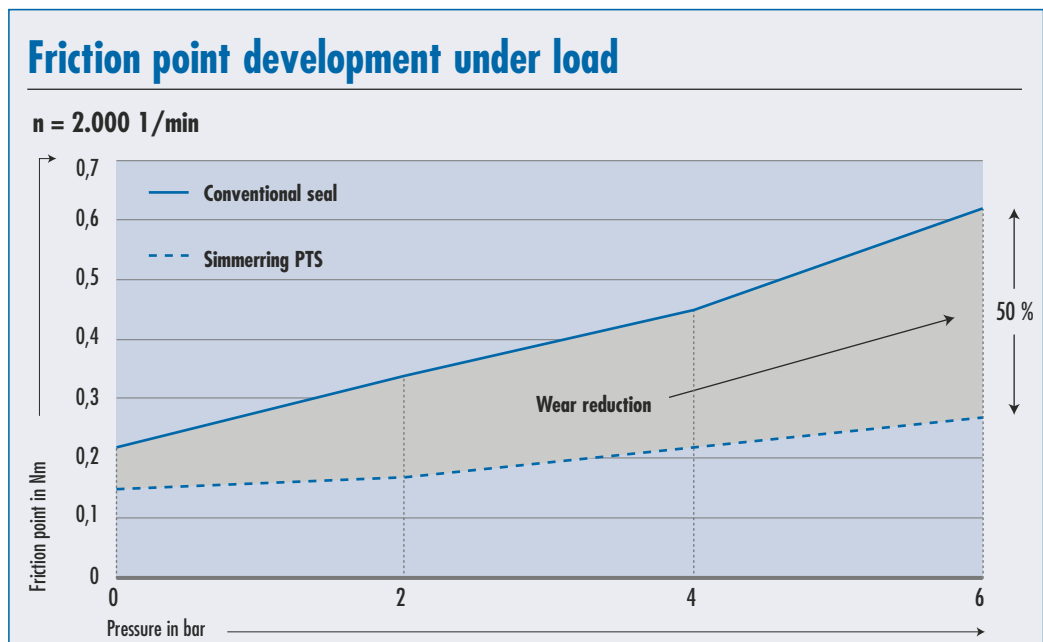
This way two seals can often be replaced by one. Furthermore, new highly wear-resistant and anti-abrasive optimised PTFE compounds have been thoroughly tested - also for use in the food-stuff industry.

Leakage rate improved by up to factor 100

With reversing shaft rotational directions, PTFE seals are usually used without media return structures. With the new Simmerring PTS, the leakage rates could be reduced by a factor of 14 in comparison to standard PTFE seals. If extremely tight sealing requirements are



Wear values in dry run for various PTFE composite materials



With the new Simmerring PTS, a reduction of friction of up to 50 % can be achieved.

made, then the Simmerring PTS with reversible torsion is available. With pressures up to 0.3 bar the measured leakage rates are reduced in fact by up to factor 100 compared to common commercially available seals. Simrit, however,

also offers the Simmerring PTS with reversible torsion for applications with a predefined rotational direction. This way, for instance, shafts with hydrostatic drives can be reliably sealed with pressures of up to 6 bar at 6.3 m/s.

