Busak+Shamban

No. 2, 2006

# in the groove

All Industries

*The world of seals and service*

Hydro Power

## Harnessing the energy of the Yangtze

Orkot® bearings on the largest hydropower project ever built

Manufacturing Spotlight

## The china connection

Trelleborg inaugurates new plant in Shanghai

Mobile Hydraulics

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WEB WATCH

A search engine by engineers for engineers

## GlobalSpec.com

GlobalSpec.com is a leading vertical search engine. It serves the engineering, manufacturing and related scientific and technical market segments. More than 3,000,000 registered users from all across the globe access the site. It is quickly becoming 'the place' where the engineering community gathers and conducts business.

**There are three main features of the GlobalSpec.com site:**

**SpecSearch Database** - providing sophisticated searching capabilities, the site analyzes over 21,000 digitalized catalogs, including those from Busak+Shamban, and returns suggestions for requested products

**Engineering Web** - indexes hundreds of millions of pages of engineering content from open websites as well as proprietary content publishers

**E-Newsletters** - provides product area information on demand

Since it was founded 10 years ago, GlobalSpec has strived to provide innovative information services that support the job tasks of the engineering and related professional communities.

## Research Efficient

### Trelleborg is a really smart spender in innovation globally, says recent study

Booz Allen Hamilton's annual research report Smart Spenders - Global Innovation puts Trelleborg among the less than 100 companies globally that get the best returns on investments in research and development (R&D). The study includes the 1,000 companies that reported the most spending on R&D around the world in 2004.
The report points out the 94 companies that are high-leverage innovators outperforming their industries, and Trelleborg is one of ten European companies on the "smart spender" list.

"These companies have a well-developed strategy for R&D that is aligned with their business and competitive conditions," comments Booz Allen Nordic's chairman of the board Torbjörn Kihlstedt.

The study uses seven performance screens, such as sales growth, gross margin percentage and total shareholders returns — from 2000 to 2005 — as the basis for the analysis. Other international giants on the list include Toyota, Apple, Google, Caterpillar and Christian Dior.

Shipments from LCA have doubled in 2006, and now 35 percent of all end-customer shipments come from LCA. Volume is expected to double again in 2007.

# On the move in America

## Spotlight on our Logistics Center Americas (LCA) facility in Fort Wayne

Busak+Shamban opened our second Logistics Center in Fort Wayne in the United States in early 2005. Part of the site of 24,000 square feet (2,230 square meters) in Indiana, it has grown to include the company's warehousing, handling systems and centralized purchasing functions.

The center stocks thousands of stock keeping units (SKUs) and uses the latest warehouse management technology, incorporating bar coding and RF scanning. This assists its productivity and in accurately fulfilling customer orders. It also provides value-added services like product kitting and certification.

"The logistics center was an important step in our strategic plan to aggressively grow market share in the Americas," said Tim Callison, President of Busak+Shamban Americas. "By accurately forecasting the needs of our customers and stocking the right products, we are slashing order lead times from weeks to days. This gives Busak+Shamban a competitive advantage when serving existing accounts as well as in attracting new business."

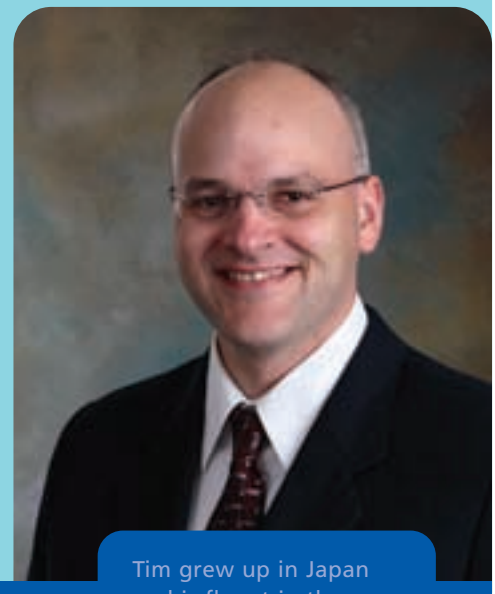
## You are welcome

**When in Fort Wayne, why not visit the Busak+Shamban facility**

# Company awards!

On 6 November 2006 Trelleborg Sealing Solutions Broomfield, USA received their certificate for achievement of the OHSAS 18001 standard for their Health & Safety management system.

Trelleborg Sealing Solutions Helsingør, Denmark and Busak+Shamban Logistics Center in Stuttgart, Germany have been audited and found to be compliant to the requirements of ISO/TS 16949:2002.



Tim grew up in Japan and is fluent in the Japanese language, an important skill, as we continue to develop our business in Asia Pacific.

## Global Automotive Segment Director Named

Tim Sprunger was recently named Busak+Shamban Global Automotive Segment Director. Tim joins us from Lear Corporation where he was responsible for Japanese joint venture operations, working both in the United States and Japan. Prior to this, he held numerous senior sales and operational roles at Visteon, where he spent a significant period of time based in Japan managing Visteon's global sales to Toyota.

"This senior appointment supports the commitment made by Busak+Shamban to significantly grow our presence in key segments in the automotive industry," said Tim Callison, President of Busak+Shamban Americas. "Tim will draw on his extensive knowledge and experience to strengthen and grow our market position in the automotive industry. He will also work closely with our existing automotive teams in the Americas, Europe and Asia Pacific."


## Exhibiting around the world

### Busak+Shamban Sweden at Elmia Subcontractor

Busak+Shamban Sweden had a successful exhibition at Elmia Subcontractor in Jönköping from 14 - 17 November 2006. An annual event it is considered to be the most important venue in Northern Europe for the subcontracting industry.

Last week some 1,200 exhibitors from more than 30 different countries and over 15,000 visitors met in Jönköping. We presented our product range with special focus on our chemical processing capabilities and Zurcon® polyurethane based product range.

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# Turcon® M30

## extends seal life against harder mating surfaces

Newly engineered Turcon® M30 from Busak+Shamban optimizes seal performance, giving exceptional integrity in aerospace primary flight controls and utility actuation systems.

To meet environmental requirements there is a trend for replacement of chrome-plated components with tungsten carbide coated ones. This has dramatically reduced the use of hazardous chemicals, but the harder, denser surface makes sealing more challenging.

### Turcon® M30 gives excellent performance

The inherent porosity of chrome-plated mating surfaces makes them able to store lubricant. This and their malleability prolongs seal life. Tungsten carbide, however, is extremely hard and can reduce seal life. Seals with better friction and wear characteristics have been found to improve sealing performance.

## Chrome - Is it hazardous ?

New regulations set forth by the US Environmental Protection Agency (EPA) and Occupational Safety and Health Agency (OSHA) require the reduction in the use of chrome in aerospace applications.
The EPA now lists chromium as one of the 17 most toxic chemicals while OSHA has identified it as a carcinogen.

Turcon® M30 is a high pressure, non-abrasive PTFE-based compound specifically developed for aerospace applications in the material laboratories of Trelleborg Sealing Solutions. Its formulation offers enhanced friction characteristics along with superior wear resistance and improved leakage control. This makes seals manufactured in this compound well suited for fitment against tungsten carbide-coated mating surfaces.

**For copies of Aerospace literature visit the Download Area on**

**www.busakshamban.com**

## Tests prove the effectiveness of Turcon® M30

The effectiveness of Turcon® M30 against tungsten carbide mating surfaces has been proven in controlled tests. The Turcon® M30 material surpassed a target leakage rate of one drop per 1,000 cycles.

In fact, leakage was recorded at only one drop per 30,000 cycles. In other research at high pressures of 5000 psi and velocity of 9 m/min (30 ft/min) over 5 million cycles, it demonstrated better wear rates than the other compounds. While in another development program, a VL seal was combined with an excluder, both in Turcon® M30. Leakage measured at 5000 psi was zero, insufficient to form a drop.

The Zurcon® U-Cup RU9 may have a similar profile to an ordinary U-Cup, but it has proven to outperform its standard rivals.

# Better by design

Busak+Shamban has used advanced sealing design to engineer the Zurcon® U-Cup RU9, and in tests it has proved to have superior performance to standard U-Cups. This innovative seal, which is manufactured from a proprietary material and includes patented technology, is able to give longer service life in rod seal applications.

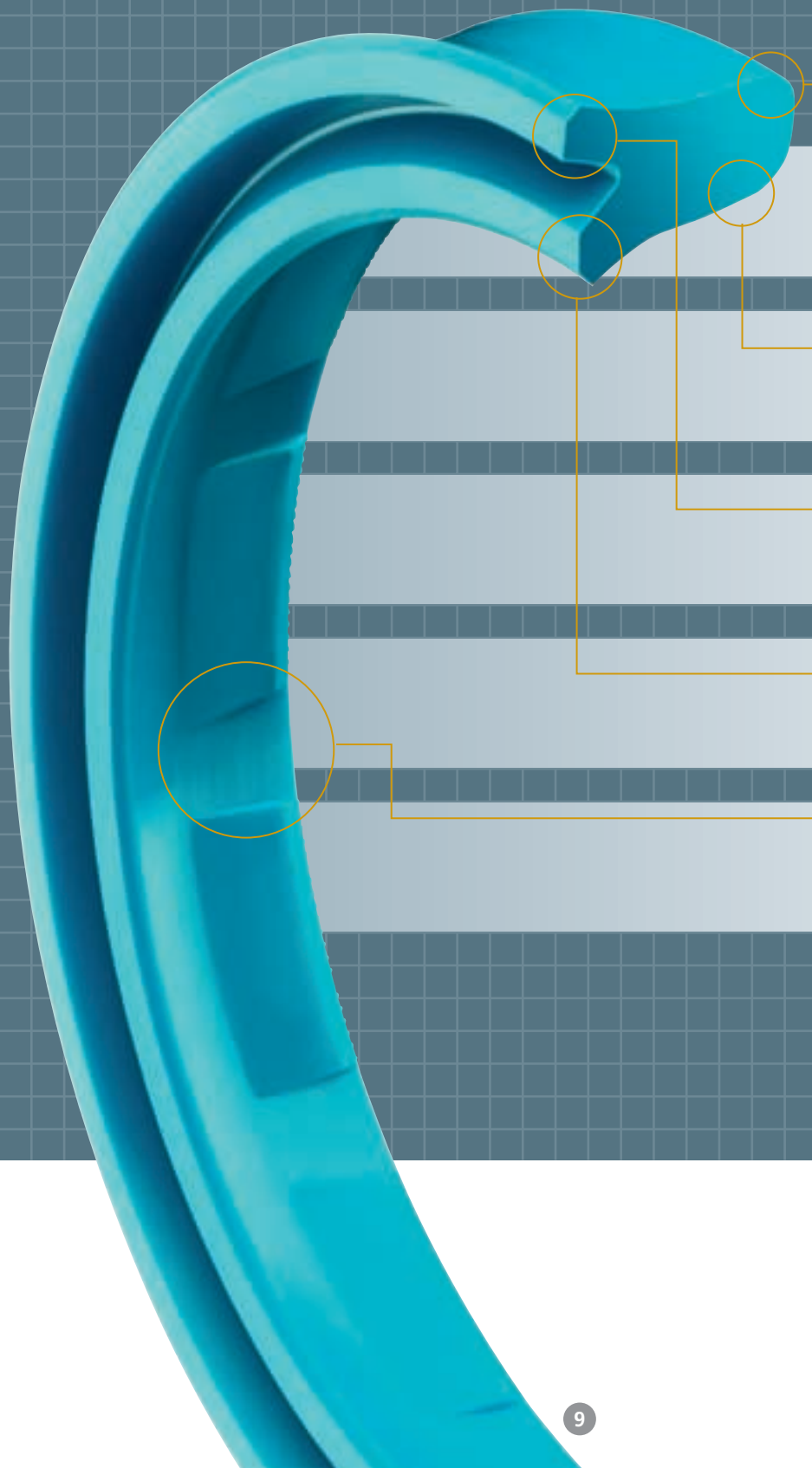
## Exceptional hydraulic sealing

When system pressure is high, the contact surface between the Zurcon® U-Cup RU9 and the piston rod increases. The seal deforms so its entire friction generating inside surface is in contact with the piston rod. This improves the pressure distribution on the rod. The resulting tribological benefits (the effect of friction, lubrication and wear of interacting surfaces) enhance the friction characteristics of the seal.

The patented microstructure of the Zurcon® U-Cup RU9 combines sliding surfaces in the seal with back-pumping channels. In back-pumping technology, on the forward stroke of the shaft an oil lubricating film is distributed under the seal. On the return stroke the oil is back-pumped into the system, preventing leakage. This extends seal life by reducing dynamic friction and breakaway force, even after pro-longed periods of rest.

The Zurcon® U-Cup RU9 is manufactured from proprietary polyurethane material specially engineered by Busak+Shamban for the production of sealing elements. This gives high wear resistance, low compression set, has a wide operating temperature range and almost universal media compatibility.

## Unique features give outstanding sealing characteristics



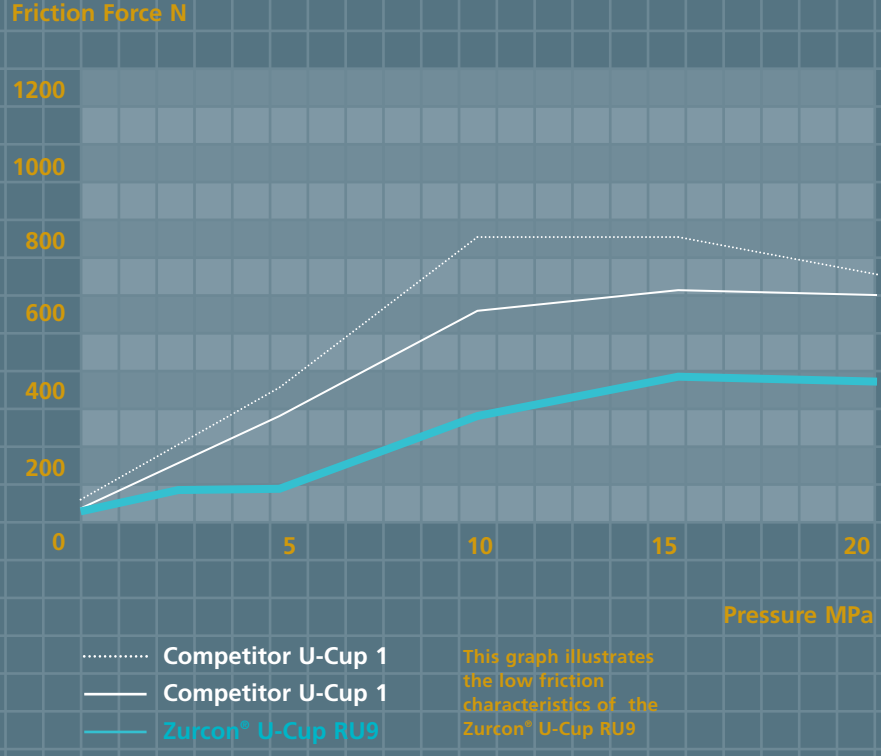
- Expansion-free space to reduce friction at the dynamic contact surface
- Expansion-free space for increased extrusion resistance
- Trimmed sealing lip
- Tight interference fit
- Excellent static sealing effect
- Trimmed sealing lip
- High dynamic and static sealing effect
- Slide segment for increased back-pumping ability
- Reduced friction
- Low heat generation

## Designed to meet demanding requirements

In mobile and stationary hydraulic applications, rod seals are exposed to high pressure and friction for extended periods. To achieve a long service life, seals must be wear and extrusion resistant, compatible with aggressive media, have a wide operating temperature range and demonstrate low friction capabilities. They also need compact installation dimensions and to be designed to ease assembly.

## Better than the rest

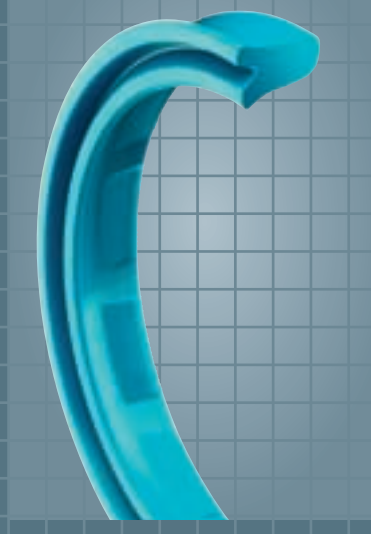
The Zurcon® U-Cup RU9 was tested alongside standard U-Cups against all the main operating criteria for U-Cups: leakage, friction forces, level of lubricating oil and extrusion. The last three were measured over a range of pressures. In all of these tests and at all pressures the Zurcon® U-Cup RU9 performed significantly better than standard U-Cups.



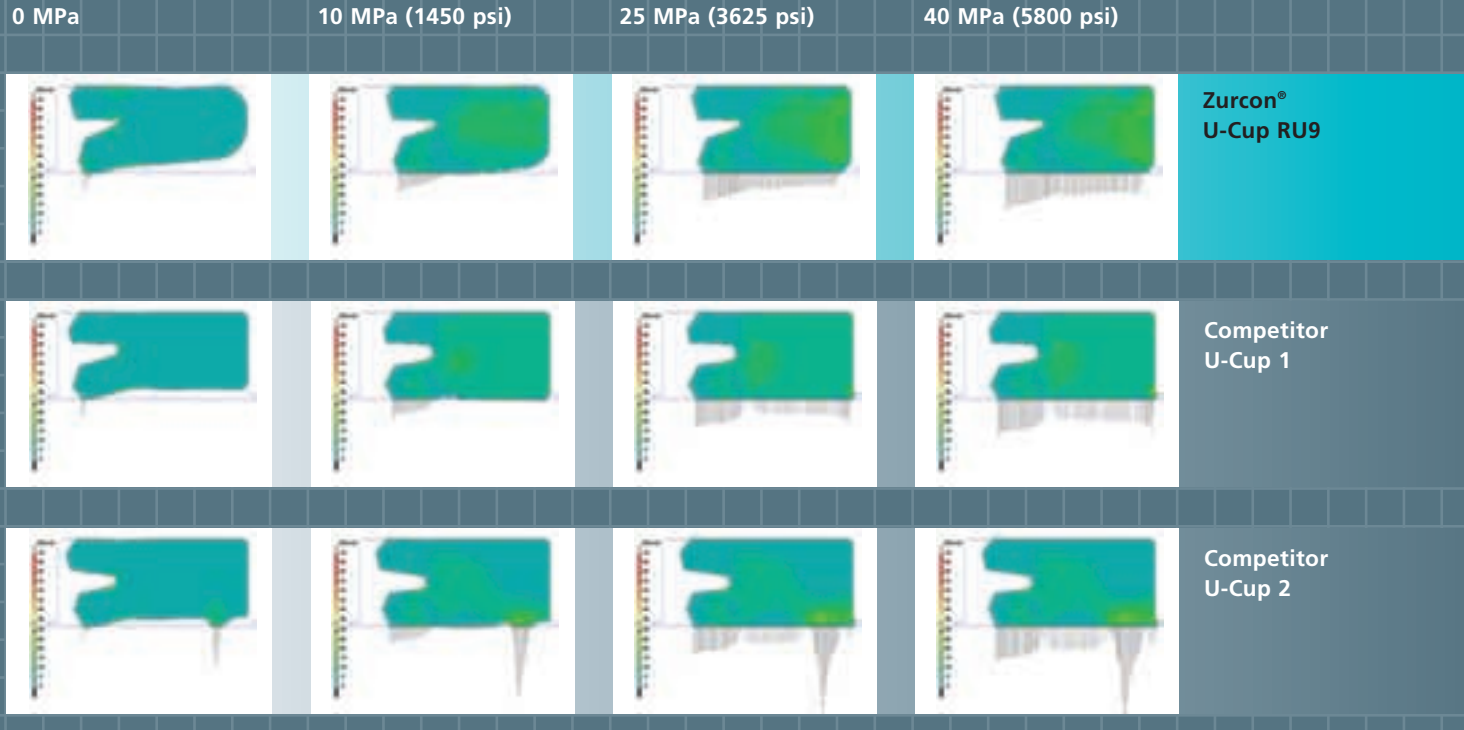

This graph illustrates the low friction characteristics of the Zurcon® U-Cup RU9

## Advantages of the Zurcon® U-Cup RU9

- Optimum solution for mobile and industrial hydraulic applications
- Long service life cuts down maintenance and downtime
- Unique patented construction gives excellent back-pumping ability
- Constant lubrication film minimizes breakaway force
- Proven performance under high pressure for extended periods
- Superb friction characteristics
- Enhanced pressure distribution on rod
- Low heat generation
- Superior extrusion resistance
- Wide operating temperature range
- Almost universal media compatibility
- Compact installation dimensions
- Designed for easy assembly



## Superior performance under pressure




FEA (Finite Element Analysis) clearly demonstrates the outstanding performance of the Zurcon® U-Cup RU9 under pressure.

**Download the Zurcon® U-Cup RU9 brochure and catalog from the *Download Area* of**

**www.busakshamban.com**

# Taking pole

From the Monte Carlo rally to the Brazilian Grand Prix, from MotoGP to the Daytona 500, Wills Rings® have been taking pole position. For over 40 years, they've helped beat the competition on racetracks around the world.

## From IMP to Formula1

The 1963 Hillman Imp might appear to have nothing in common with today's Formula1 cars. In fact, Wills Rings®, that helped improve the performance of the rallying Imps back in the 60s and 70s are widely used to optimize the capabilities of today's racing engines.

## Yesterday - a world beater

Forty years ago, Hillman Imps were often first past the flag. Back then a succession of 'Sports Imps' achieved success in races and rallies worldwide. Their engines were 875 cc (39 bhp) aluminium with an overhead camshaft. An adaptation of the Coventry Climax racing engine, the designers included many new developments to maximize performance. One such innovation was the use of metallic Wills Rings® seals within the cylinder head.

## Today - still a winner

The Imp ceased production in 1976, but today leading race teams still incorporate Wills Rings® as a standard sealing solution within cylinder heads.

"Wills Rings® were the original metallic seal," says Stuart Moares, who is product manager for the range. He is based at Trelleborg Sealing Solutions, Bridgwater, where the seals are manufactured. "The technology behind Wills Rings® has stood up to the test of time. Motorsport designers around the world appreciate their performance and our exceptional service."

## Delivery direct to the pits

"We're used to pulling out all the stops for our Formula1 customers," continues Moares. "There have been cases where we have supplied the product directly to the pits. In an emergency situation, we may receive a last minute call. Our customer needed a special Turcon® Variseal® urgently. We manufactured the product immediately and it was hand delivered to the racetrack in less than 24 hours."

**Download a copy of the Will Rings® catalog from the Download Area of**

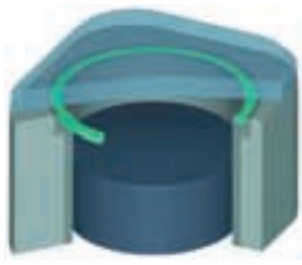
**www.busakshamban.com**

# position!

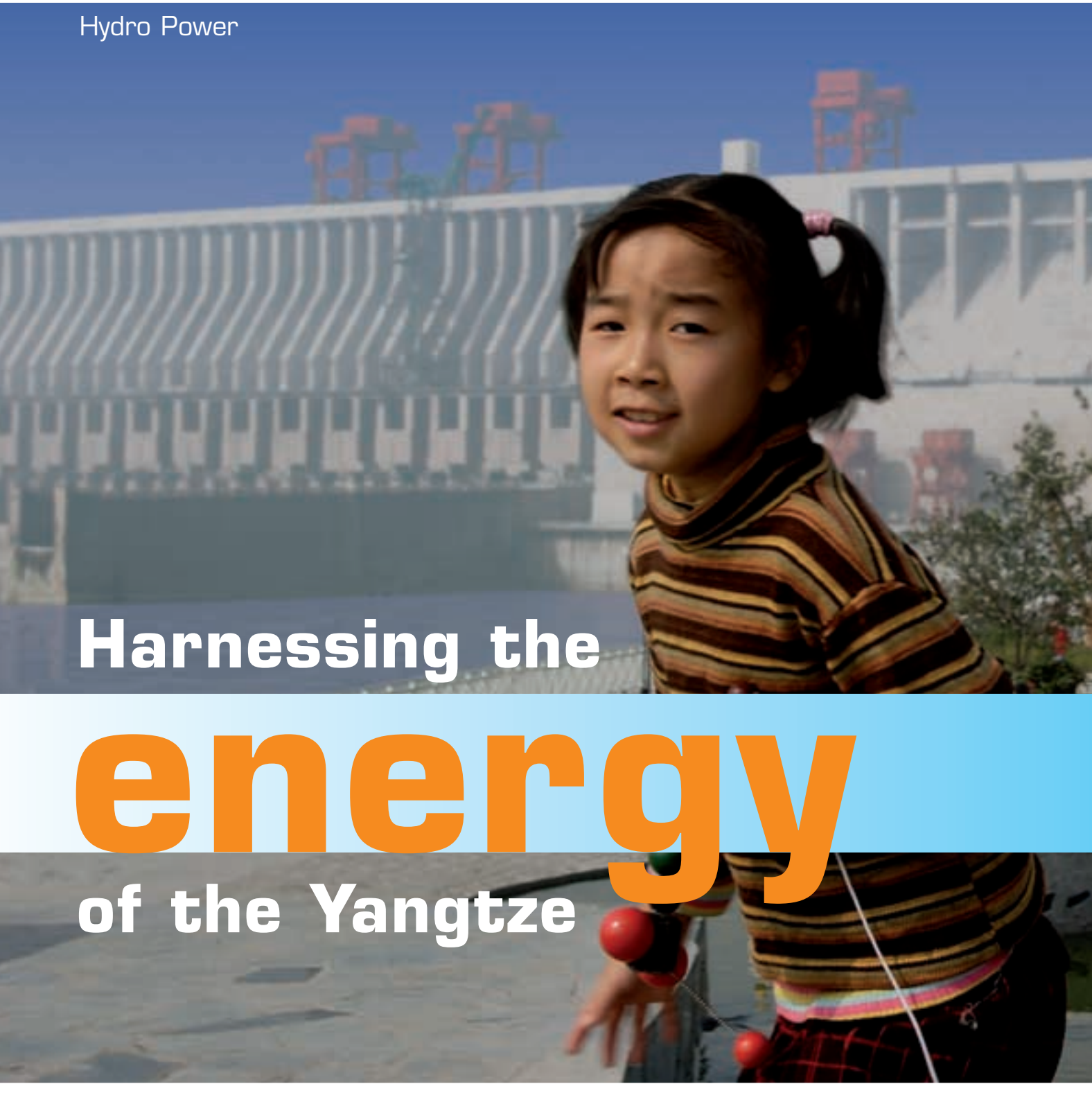
## Wills Rings® - the original metallic seal

The Wills Rings® generally used in motorsport applications are of the O section design. These are gas filled and offer far greater elasticity and response than conventional solid seals or laminated gaskets. They are able to withstand extremes of temperature, from cryogenic to 850°C (1562°F) and pressures up to 1000 Mpa (145040 psi). Their ability to operate at these levels means they can easily meet the performance requirements of high-end racing applications.

**Finite Element Analysis (FEA) is used to select the correct design for an application**



**Wills Rings® may have been available for 40 years, but the latest technology supports our customers**



# Harnessing the energy of the Yangtze

Hydro generators from Alstom are turning waterpower into electrical energy in the largest hydropower project ever built, the Three Gorges in China. Orkot® bearings, manufactured at Trelleborg Sealing Solutions Rotherham, are helping them to do so.

Jacques Brémond

At the foot of the Alps, located in Grenoble, France is the world's number one in hydropower generation. Hydropower was born in the mountains around there. Back in 1854, Casimir Brenier started work on hydraulic turbines to convert the power of flowing water into electrical energy. His company is now a subsidiary of Alstom Power and the global Technology Center for their hydropower business.

## Asia, led by China, is the largest hydropower market

"The US still has the largest hydropower capacity, but Asia, led by China, is the fastest growing market," says Jacques Brémond, Mechanical Engineering Supervisor at the Alstom Turbine Technology Center. "In Europe and North America power generation exceeds the demands of the population, while in China and India increased capacity is desperately needed."

Filling the energy gap has led to the biggest hydropower plant in the world, the Three Gorges on the Yangtze River in China. For this Alstom is supplying almost half the turbines and generators.

## The greatest challenge of Three Gorges dam was its sheer size

"One of our main functions here is to coordinate our global manufacturing units on big schemes," says Brémond. "The Three Gorges project has involved France, Brazil, Korea, Norway and China. Its greatest challenge was its sheer size. Compare the width of the Three Gorges at 2.4 kilometers (1.5 miles) to that of a typical dam, which is around 100 meters (328 feet), and you begin to appreciate the scale of the undertaking.

## An environmentally friendly bearing solution

One of the big advantages that Orkot® bearings have is that they are 'fish friendly'. Most metal bearings need grease to make them work properly and during operation this lubricant goes into the water. That is not very good environmentally.
Orkot® material has excellent friction characteristics which means no grease is required. Greaseless metal bearings are available, but the Orkot® product is a very cost effective and reliable alternative.

"The main part of a hydro turbine is its runner, where the water's flow is converted to mechanical energy. For the Three Gorges, the external diameter of the runner was 23 percent larger than any other we'd produced before. It was a massive 10.6 meters (35 feet) in diameter with a height of 5 meters (17 feet).

## Alstom produced larger turbine runners than ever manufactured before

"It was impossible to produce the runners in the Alstom workshop in Grenoble. This was because when completed they needed to be transported over the town's bridge. A single runner's weight of 425 tons was greater than the bridge's 300 ton weight limit. The runners were therefore manufactured in a specially constructed workshop in La Ciotat, south of France. Transported by sea, once in Shanghai port, the runners were transferred from ocean going vessels to riverboats. It takes six of these just to carry the draft tube elbow.

"We were not able to specify Orkot® bearings on the left bank of the Three Gorges," says Brémond. "Back in 1997 and 1998 when we were engineering the turbines for that, it was the early days in proving Orkot®. We had little experience of the product and the customer requested that we design in a known solution."

Olivier Calemard

Veronique Bastide

# An exciting moment when they accepted Orkot®

A team of three people in Busak+Shamban France is dedicated to supporting the Alstom Technology Center and Grenoble Unit design office. Jacques Brémond's main contacts are Olivier Calemard, Account Manager for Alstom in Grenoble and Veronique Bastide who is on the technical side.

## Originally 'plastic' bearings were laughed at

"Ten years ago the only products we supplied to Alstom were Orkot® Wear Rings," said Olivier. "When I first arrived at Alstom with my 'plastic' bearing they laughed a little. It was so light compared to the metal ones they used; they could not believe it would be strong enough to do a good job."

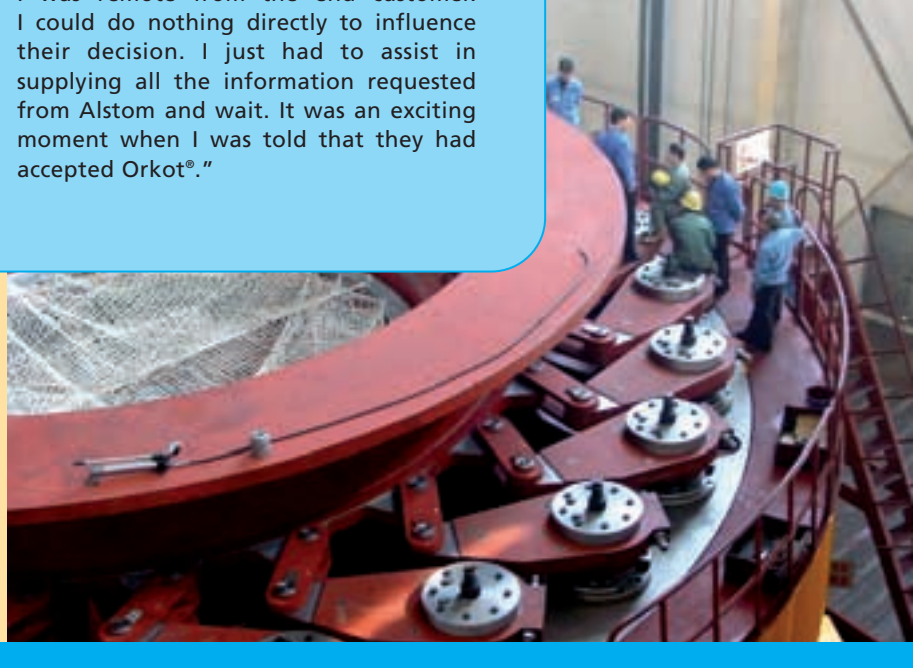
Getting Alstom's business was an uphill battle for Trelleborg Sealing Solutions Rotherham and the Busak+Shamban marketing company in France, but Calemard is certainly not one to give up.

## Orkot® bearings are used on the majority of Alstom installations

"We had to prove that Orkot® could stand up to the task," Calemard says. "Alstom would not risk specifying an unreliable component. The cost of replacement of a failed bearing is huge. It took time and lots of independent research and test data to convince them to use the product. Now, though, it is regularly used in the majority of their installations."

"At the beginning I thought that Three Gorges was too big a project for us," says Olivier. "When Alstom recommended the product, it was difficult for me because I was remote from the end customer. I could do nothing directly to influence their decision. I just had to assist in supplying all the information requested from Alstom and wait. It was an exciting moment when I was told that they had accepted Orkot®."

**The runner converts the water's flow to mechanical energy**



**Installation of Alstom hydro generator in Three Gorges dam**

An amazing system of locks and a ship lift will allow boats to ascend the 175 meters (574 feet) high Three Gorges dam.

## Three Gorges Dam - China's biggest construction since the Great Wall

There were three main reasons behind the building of the Three Gorges dam. The first was to regulate the flow of the Yangtze. Its notorious floods have claimed an estimated one million lives in the last one hundred years.

The second reason was to make the river navigable into the center of China. Once completed the river will be deep enough to enable 10,000 ton ocean going freighters to sail directly inland 2,400 kilometers (1,500 miles) for six months of the year.

The third reason for the dam was to generate power. The hydropower plant is expected to create as much electricity as 18 nuclear power plants. It will provide an estimated one-ninth of the nation's energy and replace 40 to 50 million tons of raw coal combustion each year.

### Independent test results persuaded Alstom to use Orkot® bearings

"Initially we were cautious about using Orkot® for bearings because we knew metallic 'greaseless' bearings worked. To support their product, Trelleborg gave us details of two independent tests on Orkot® specifically for this application. In both of these Orkot® was assessed against different types of materials and results were favorable.

"Based on these reports we were more and more confident about the performance of Orkot® and decided to trial it in the wicket gate lower bushes during refurbishment of a Francis turbine in the Liu Jia Xia dam in China. After a few more tests in application, the product seemed successful and was first fitted in a big way on turbines supplied to the Alqueva Hydro Power Plant in Portugal commissioned in 2004.

### Orkot® bearings are specified on the turbines for the right bank of Three Gorges dam

"When specifying equipment for the right bank of Three Gorges, Alstom in Brazil was keen that Orkot® bearings were recommended to the customer," says Brémond. "We and Brazil worked together to persuade the customer that Orkot® would be a good alternative. It was not an easy task requiring references, samples and test reports. In the end, they accepted the change in technology."

"As you can see from Three Gorges, which had a time frame of almost ten years from initial discussions to the first commissioning, our projects are very long-term. A supplier has to be patient in their wait for an order. From the beginning of a contract up until the time of purchase and



## How the runner works

In a gravity dam, the water flows down from a reservoir into a hydro turbine. It enters the runner from one side via a spiral case, which distributes the water around the turbine. Here, a distributor with adjustable wicket gates controls the flow of water circulating in it. The energy of the water (head and flow) transforms into mechanical energy (torque and rotational speed). This then converts to electrical energy within the generator connected to the same shaft as the turbine. Once the water has been through the runner it goes down a draft tube back into the river.

## Consistent product wherever it is manufactured

Orkot® bearings are developed and produced at Busak+Shamban associated manufacturing company Trelleborg Sealing Solutions Rotherham. They are also manufactured at Trelleborg Sealing Solutions Eugene for the American market. Due to the scale of the Three Gorges, the two sites worked together to fulfill the order and shared technology.

"We do bench marking of processes across the two sites," says Barry Davies, General Manager of Trelleborg Sealing Systems Rotherham. "This is to ensure product consistency. Working on a project like Three Gorges brings this requirement right to the forefront. All these parts are going to be side by side in the one facility. You have got to be the same because you are supplying the same product to the same end customer."

beyond, we need technical answers. Some companies only give you commercial information, but that is not good enough. We have refused to deal with suppliers who cannot provide back up. The technical support we receive from Trelleborg, along with the product itself, is its greatest strength. That is why we are going to continue developing Orkot® solutions for hydro generators with Trelleborg in the future."

**To find out more about Orkot® in hydropower applications go to**

**www.orkothydro.com**

EGR valves on vehicle exhaust systems aid smog reduction by helping cut down NOx expelled into the atmosphere. Busak+Shamban meets the challenge of sealing these in diesel engines.

# Smog busters

## Leading sealing technology for EGR systems

Adapting the EGR Valve to diesel fuel, which is heavier and oilier than gasoline, makes sealing of these challenging. The oilier fuel tends to build up carbon deposits more quickly than in gasoline engines and the exhaust gases can form as a sticky gum or even hard residue. This contamination often causes premature seal or bearing failure, making the valve inoperable.

"When designing the sealing configuration a balance must be struck between friction and the response time of the valve," says Jerry Zawada, Segment Manager, Electromechanical of Busak+Shamban. "For example, a gas-tight seal requires more preload and friction, which decreases the valve response time. Lightening up on the preload, though, allows exhaust vapor to pass the seal and congeal on the shaft and bearings, eventually leading to failure."

## Recommending the optimum seal combination

Tolerances are therefore of great importance, and Busak+Shamban offers a variety of seals that can match these design requirements. Seals must also be chemically compatible with diesel fuel and be capable of operating over a wide temperature range and pressures.

"We have the experience to recommend the optimum seal combination for the job," continues Zawada. "Busak+Shamban is at the forefront of EGR Valve sealing technology and has come to the aid of many diesel engine and EGR manufacturers in recent years, both in Europe and in the US. Our global presence has given us a competitive advantage on several applications. We are uniquely positioned to offer our customers the most cost effective solution to meet their application needs."


For more details on automotive applications go to Industries section on

www.busakshamban.com

## Proven sealing solutions for EGR valves

### Turcon® Double Delta®

provides significant improvement in valve performance. The excellent friction characteristics of our proprietary Turcon® PTFE-based material allows the component to ride easily on the solenoid shaft. An O-Ring, typically made of FKM, energizes it.

### Turcon® Glydring® II

gives engineers added flexibility in their design by lowering tolerances required. Here the elastomer energizer is bonded to the Turcon® seal. This reduces tolerance stack up and performance variation.

### Turcon® Variseal®

is recommended for gas-tight and high temperature applications. Here the Turcon® jacket is energized with a spring. This seal has very good compression set and heat aging characteristics. Sealing function and friction are therefore consistent over time, resulting in superior valve performance.

### Scrapers

can be used in conjunction with any seal in the EGR system. This keeps debris from building up on the shaft and extends valve and seal life.

## Environmentally friendly fuel handling systems

Unburned gases that remain in vehicle cylinders after the combustion cycle are vented into the atmosphere through the exhaust system. Early devices to reduce emissions limited excessive hydrocarbons and carbon dioxide, but tended to encourage formation of oxides of nitrogen (NOx). When in the atmosphere, these cause smog and as the number of vehicles increased, so did the

amount of air pollution. A more environmentally friendly solution was therefore required.

### Better efficiency, lower emissions

Automotive engineers developed the Exhaust Gas Recirculating (EGR) system to reduce these NOx emissions. This diverts exhaust gases back to the air intake to burn exhaust gases twice. By doing this, emissions are significantly reduced. The EGR valve is fitted between the exhaust and air intake and regulates the amount of exhaust gases that go through the system.

These EGR valves are actuated by a vacuum, pressure or mechanical system. In recent years, electronically controlled versions have gained popularity.

## Cracking-up in just a few weeks

Almost half of all O-Rings are used in 'outer' seal, piston sealing applications, which means that they are elongated when fitted. Critical elongation is above a 5 percent expansion of the inner diameter. Beyond this, in a matter of weeks, ozone cracking will occur unless the seals are protected from the ozone effect on storage.

To solve this problem, Busak+Shamban adds a new harder NBR material to our range of ozone-resistant materials. Engineered to prevent cracking when O-Rings are stored in an elongated state in a subassembly, this compound, with a hardness of 90 Shore A, is available in addition to our already successful 70 and 80 shore A materials.

## Busak+Shamban ozone-resistant materials help prevent cracking and extend seal life

All ozone-resistant NBRs have the same benefits as a standard NBR; an operating temperature (depending on media) of -30°C to 100°C (-22°F to 212°F), good mechanical properties, resistance to mineral oil and grease and excellent elongation characteristics. Also, the material shows no ozone cracking when tested to DIN 53509-1. In this test, samples are tested in an ozone concentration of 50 pphm (+/- 5) when elongated by 20% for 120 hours at a temperature of 40°C (104°F) and humidity of 55 percent (all percentages at a tolerance of +/- 2%).

The new 90 Shore A material is available as standard O-Rings. The 70 and 80 Shore A material can be manufactured as O-Rings and custom-molded parts.

# Are your O-Rings at risk of attack?

Down deep in the depths of dusty warehouses lurks an invisible enemy. Unseen but deadly, ozone is a killer to the average seal. Now there is a material that is really 'hard' and can resist attack.

### The effect of ozone on elastomers

Ozone is another form of oxygen, where three atoms of oxygen, rather than two, join to form a molecule. Ozone is formed in the air, for example, from discharges produced by electrical equipment. Since it is chemically very reactive, in contact with rubber materials it causes them to crack, especially when under tension.

## Seals stored in subassemblies suffer ozone attack

Typical applications are fluid connections, including tube fittings in static or mobile hydraulics. These are often of a conical design to ensure a connection is maintained under high pressure. For sealing integrity, these seals have a small cross section compared to their large diameter and are manufactured of NBR, which has good elongation properties. They are designed to elongate in the seal groove between 5% and 17% to stop movement.

Hydraulic tube fittings are usually stored as ready-to-use subassemblies, with the seals fitted in an elongated state. When stored, the seals will suffer ozone attack and standard NBR shows signs of cracking, especially when stored at high temperatures.

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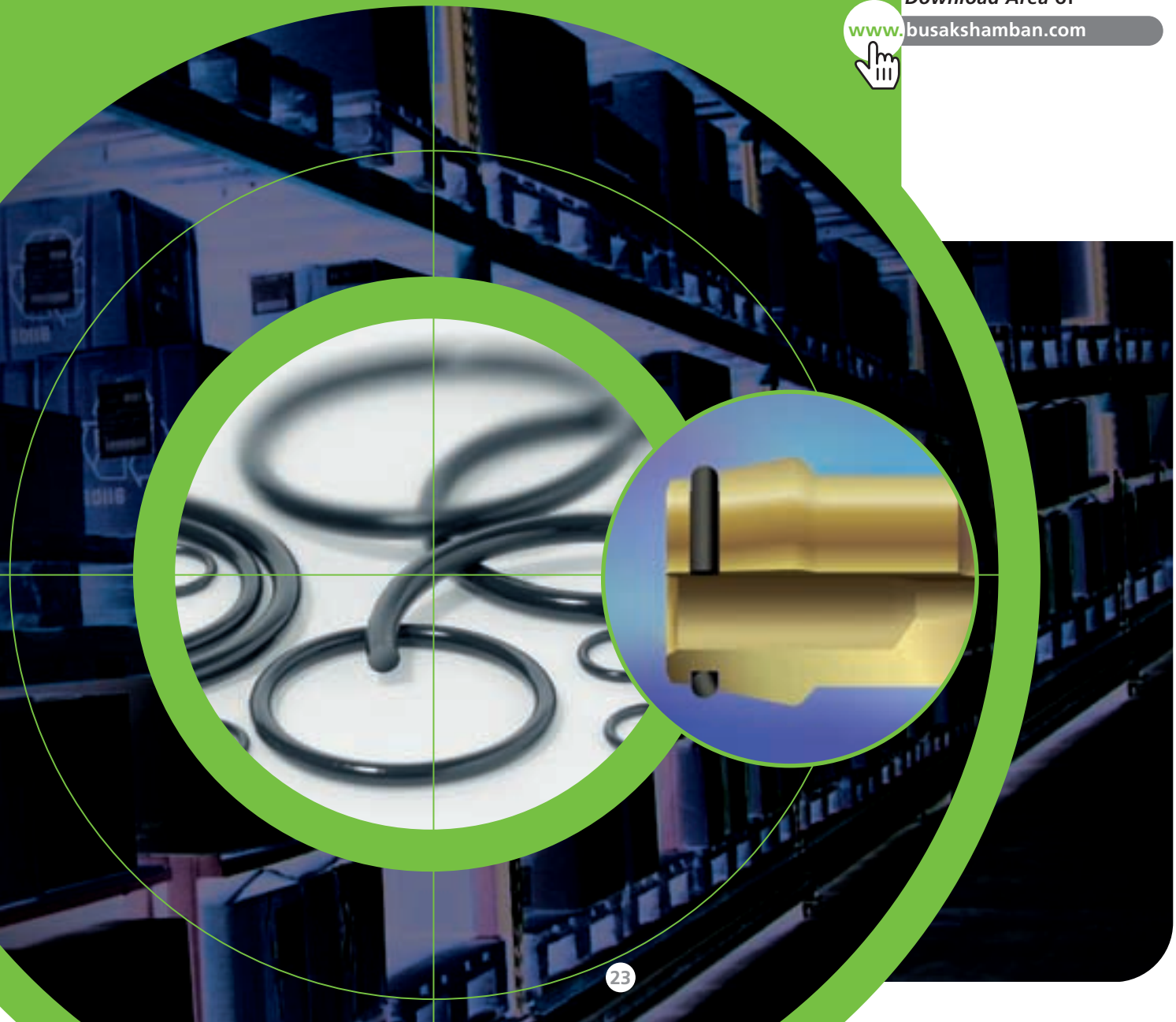

# The China connection

## Trelleborg inaugurates new plant in Shanghai

In August this year Trelleborg Sealing Solutions, associated manufacturing company of Busak+Shamban, inaugurated their newly constructed manufacturing facility in China's expansive Shanghai region. The increased production capacity from this state-of-the-art plant means Trelleborg is now better able to meet increasing demand from industry in China.

Serving key markets including aerospace, chemical processing, semiconductor and oil & gas, many of Trelleborg's proprietary high technology sealing products will be produced at the Shanghai facility. It will have around 100 employees by the end of the year, and the total area of the plant, designed to meet stringent environmental standards, is 10,000 square meters (107,640 square feet).

"This is another stage in strengthening our position in China," says Claus Barsøe, President of the Trelleborg Sealing Solutions business area. "We now have a best-in-class facility with enough capacity to meet growing demand. Alongside manufacturing we will provide a full service from the Shanghai site. This will include technical support on design and product development in conjunction with research and testing for both local and international customers."

TRELLEBORG
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## Booming Shanghai

Today, China has the second-largest economy in the world, and it is also one of the fastest growing. It is predicted that by 2040 China's economy will be larger than that of the United States on an overall basis, and at the heart of that growth is Shanghai.

Built on a swamp at the mouth of the Yangtze River, Shanghai was a small fishing village until it was colonized in the mid-19th century. Today, greater Shanghai with its 19 districts and three islands, extends about 120 km (74 miles) north to south and 100 km (62 miles) east to west. With a land area of 6,340 sq km (2,448 square miles), it is the fourth most densely populated city in the world, with nearly 2,900 skyscrapers that are 18 stories tall or taller.

Although at around 20 million, less than 2 percent of China's population lives in Shanghai, the city contributes more than 11 percent of China's total income. A quarter of all commodities in China pass through Shanghai's port, one of the largest in the world.

Shanghai is now the biggest commercial center and the largest industrial base in China. It recorded its 14th straight year of double-digit economic growth in 2005, with strong exports driving gross domestic product (GDP) to increase by 11.1 percent to 912.5 billion Yuan (90 billion Euros).

Shanghai's economy is primarily based on manufacturing. Its main industries include automobile, electronic and telecommunications equipment, manufacturing of power station equipment and parts, petrochemical and fine chemical processing, iron and steel and home electric appliances.

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Busak+Shamban

# Busak+Shamban at a glance

- Part of Trelleborg Sealing Solutions, a business area of the Trelleborg Group
- Employees: 5700 (Trelleborg Sealing Solutions)
- Research and Development Centers in Europe and America
- Over 30 manufacturing plants worldwide
- 40 Marketing Companies worldwide
- Quality Certifications: ISO 9001:2000 and ISO/TS 16949:2002
- In-house polytetrafluor-ethylene, polyurethane development and elastomer development
- More than 2000 material formulations
- Worldwide distribution network

Contact your local Busak+Shamban Marketing Company at:
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