

in the groove

The world of seals and service

Semiconductor

Semiconductor sealing one-stop-shop



Chemical, Pharmaceutical, Food and Beverages

Sealing for a green alternative Making hydrogen fueling possible

Oil & Gas

Gaining the seals of approval Compliance to Norsok M-710 standard

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Editorial

Welcome to our second edition of 'in the groove' focusing on semiconductor sealing solutions.

The semiconductor industry requires continuous improvement in their processes to increase plant productivity. This has led to rapid changes, innovation being the key to remaining competitive. Effective sealing solutions play an important role. This issue will tell you about the wide range of options available to semiconductor equipment manufacturers and specifically about sealing in the challenging area of vacuum processing.

Busak+Shamban is exhibiting at SEMICON Europa 2006 in Munich. Why not meet us on our stand to discuss your applications? Or take up our offer of ordering a free Semiconductor Sealing Solutions Toolkit, to make designing your assemblies quicker and easier.

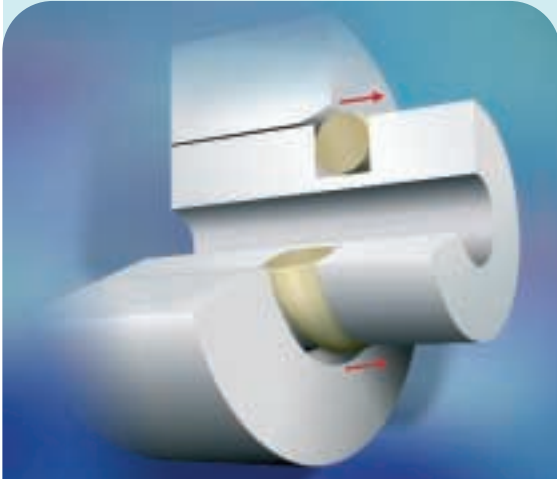
The chemical processing section outlines results that prove, against all competition, Isolast® J9503 was a winner. This performed better than any other FFKM material tested in chemical immersion trials. And on a subject much talked about recently, details are given of sealing solutions provided to WEH, who manufacture filling systems for the alternative fuel, hydrogen.

Busak+Shamban is proud to announce details of certificates for compliance to Norsok gained on 11 materials, in our oil and gas section. A great achievement, meaning Busak+Shamban has more Norsok compliant sealing compounds than any other supplier. A new marketing company opens in Russia, set up mainly to support our oil and gas companies in that region. We can now offer excellent service including application engineering at over 40 locations globally – 11 in the Americas, 15 in Asia Pacific, and 17 in Europe.

After the success of the first edition of 'in the groove', I am confident that you will enjoy this second issue. Happy reading!

Dr. Sandro Silverio
Director - CPI Segment Europe

news



Grab your coat

Busak+Shamban is a leader in coatings technology, identifying many treatments that improve the friction characteristics of our seals. These aid automated assembly by helping stop seals sticking together or twisting in their housing.

In food and beverage production coatings must be compliant with a number of approvals. One of our coatings, FF coating, has recently gained compliance with the standards of the German Federal Environmental Agency (FEA), valid for the area D2 (seals). This is in addition to its FDA compliance, making it suitable for use in most food, beverage and drinking water applications.

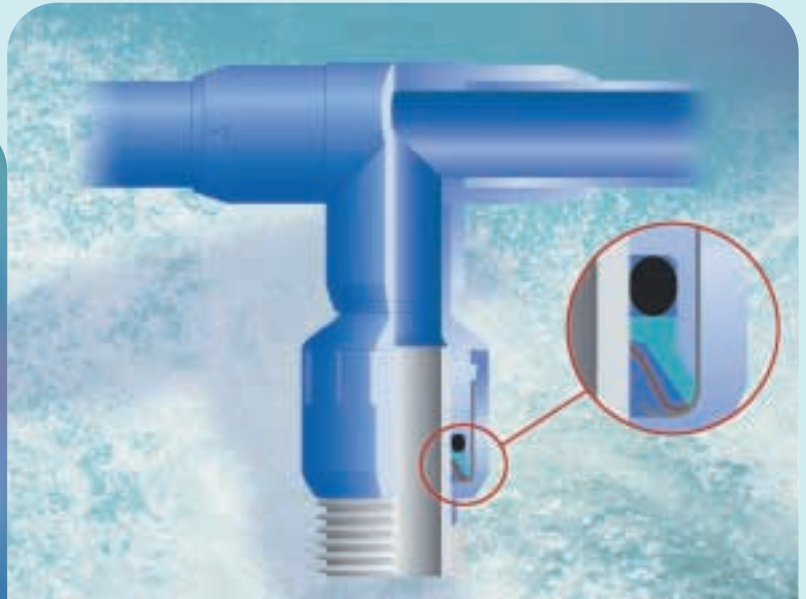
FF Coating features:

- Used at a thickness between 2-10 μ
- Water based
- Solvent-free
- Transparent
- Operating temperature from -40°C to +150°C (-40°F to +302°F)
- Does not affect the seal's natural elasticity
- Suited for both static and low-level dynamic applications, with infrequent movement and short stroke rate.

Brochure at:

www.busakshamban.com/groove

Go to the Shop!



Keep it watertight

Drinking water is a precious commodity. Making sure as little as possible is lost is important and domestic water pipes must be guaranteed watertight for 50 years. Key to achieving this is effective sealing.

Sealing requirements are demanding, as most new pipes are plastic and increasingly quick fit connections are used to speed fitment. When you consider still 70% of the world's population do not have access to clean drinking water, installation of water systems as quickly as possible, that are virtually leak free, is a major priority. And when most of those systems are required in the developing world, minimizing cost is vital.

Sealing material development for water system applications has therefore focused not just on performance but also on making cost of production as low as possible. Which means to meet cost criteria, O-Rings need to be produced by injection molding.

To make injection molding of O-Rings possible, softeners are usually added to the elastomer to give better flow of material into the injection tool. The resulting better fill increases seal output and makes production costs lower. But, softener may migrate into plastic components such as pipes and quick connectors. This can lead to cracks in the plastic parts, which is not acceptable.

Busak+Shamban has solved this problem. We now have a broad range of materials available that balance the use of softeners with material performance. They also meet approvals to various international standards, making them universally compliant globally.



From left to right:

- Paul Neath**
Production Manager
- Ellen Sargeant**
Global Accounts Executive
- Ian Phillips**
Internal Sales and Planning
Coordinator
- Chris Stowell**
Technical Manager
- Ursula Porelle**
Product Manager
- John Chandler**
Senior Product Engineer

Meet the Isolast® Team

Isolast® Seals, a Business Unit of Trelleborg Sealing Solutions Ashchurch, an associated manufacturing company of Busak+Shamban, is now in its 9th year of operation. From its production base in Gloucestershire, England, a full range of Isolast® FFKM materials are available for aggressive sealing environments. The team makes sure that customer demands are met as quickly and efficiently as possible, priding itself in its cleanroom facility and excellent delivery record, even achieving same-day turnaround when required.

Very approving

Seals, integral in products and processing systems, must meet or comply with numerous international approvals. Perhaps some of the most stringent relate to pharmaceutical, food and beverage processing which call for FDA and USP compliance. While for the water and gas industry, there is a wide variety differing by region, especially relating to potable water.

Busak+Shamban has invested heavily in development of materials inline with these requirements. We offer the broadest range of compliant sealing materials available from any seal developer and manufacturer. In fact, we believe there is not an approval we cannot meet with one of our compounds. And if there is, we'll make sure a compliant material will be available as soon as possible.

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Disclaimer: The information in this magazine is intended to be for general reference purposes only and is not intended to be a specific recommendation for any individual application. The application limits for pressure, temperature, speed and media given are maximum values determined in laboratory conditions. In application, due to the interaction of operating parameters, maximum values may not be achieved. It is vital therefore, that customers satisfy themselves as to the suitability of product and material for each of their individual applications.

Any reliance on information is therefore at the user's own risk. While every effort is made to ensure the accuracy of information contained herewith, Busak+Shamban cannot warrant the accuracy or completeness of information.

For exceptional operating conditions, please contact your Busak+Shamban representative.



Come and see us

In April 2006, Busak+Shamban will be attending Semicon Europa. Why not visit us? You will find us in Hall A2, Stand 175.

We will also be happy to meet you at other exhibitions where we will be present this year.

Semicon West, USA	10 - 14	July
Semicon Taiwan	11 - 13	September
Semicon Japan	7 - 9	December

Semiconductor manufacturing processes are extremely aggressive. Seals are often housed in areas of the processing system where they must withstand highly destructive liquids, gases and plasmas, at elevated temperatures or in vacuum conditions. To ensure long service life, equipment designers must have available the right seals to stand up to the job.

Semiconductor sealing one-stop-shop

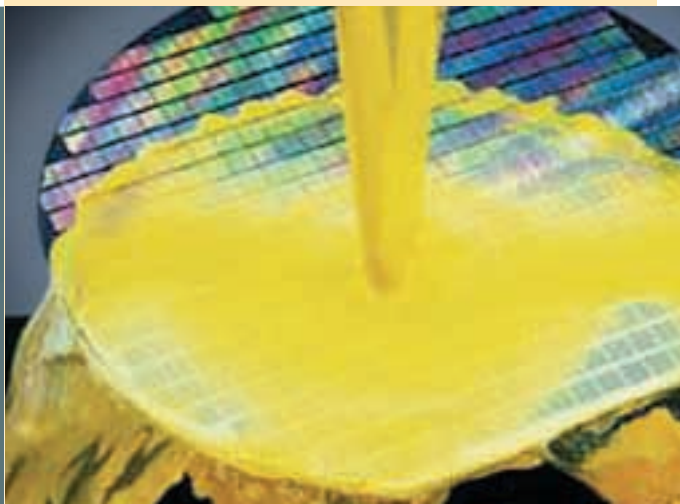
Aiming to maximize semiconductor equipment performance

At Busak+Shamban, we know that designers of semiconductor equipment want to maximize the performance of the machines they manufacture. Selecting the optimum seal material and type can help ensure that. Using the right seal increases service life and extends meantime between planned maintenance (MTBM). This will reduce downtime, maximize production efficiency, yields and process reliability, meaning overall, total cost of ownership is minimized for the customer.

The experience and range to offer the right seal for the job

Busak+Shamban has lots of experience in providing sealing solutions to semiconductor equipment manufacturers. This allows us to recommend the best possible option from our extensive range of innovative seal materials and products. Many of these are specifically engineered to meet the increasingly demanding requirements of the semiconductor industry, giving exceptional sealing integrity. We are a one-stop-shop for the majority of sealing needs, even the most difficult within this critical manufacturing process.

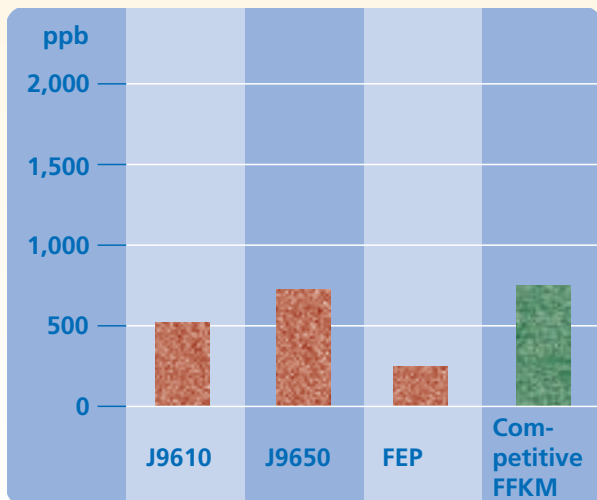
Wet process applications



These chemically intensive processes involve wet process chemicals including acids, such as hydrofluoric, alkaline solutions like sodium hydroxide and solvents, typically N-methylpyrrolidone or acetone.

Wet manufacturing process steps include etching, stripping, plating and CMP (Chemical Mechanical Planarization). These are followed by wafer cleaning, removal of all surface contamination of particulates, organics, metallics and native oxides and all liquids used must have extremely high purity. Optimum seal performance is critical in ensuring maximum uptime throughout the ULSI (ultra large scale integration) process. A range of products is offered that give almost universal chemical resistance, minimum leach out of ionic impurities and extremely low particulation.

Total Metallic Extrables in UPDI at +85°C (+185°F), 1 week by ICP/MS

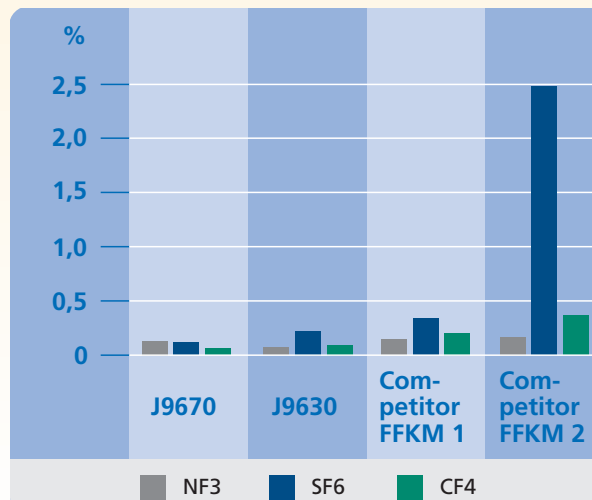


Aggressive plasma systems



Plasma is used at various stages during wafer fabrication. The plasma state is created when a gas is subjected to energy, breaking down its molecular integrity and dissociating it into ions and electrons. Many of the gases used to do this in semiconductor processes are toxic, reactive and pyrophoric. It is essential that seals withstand this harsh plasma environment where they will be subject to high energy and possibly elevated temperatures. Inadequate sealing can lead to contamination and affect product yield. Ultra pure sealing solutions from Busak+Shamban ensure long-term reliability with minimal particulation and extremely low outgassing.

Weight Loss in Plasma Environments

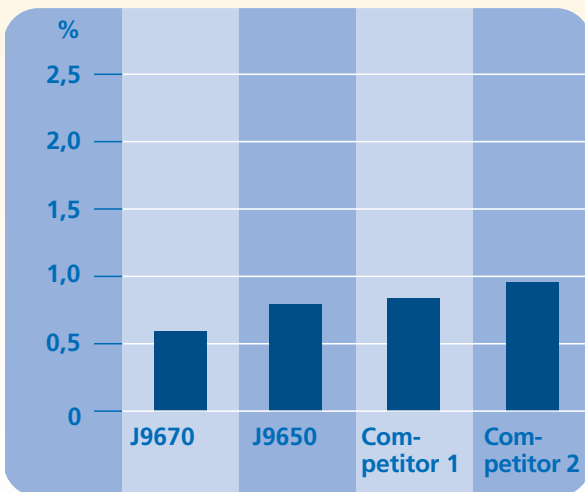


High temperature resistance



High temperature wafer processing and plasma applications include Rapid Thermal Processing (RTP), Chemical Vapor Deposition (CVD) and dry plasma etch. Seals must withstand temperatures above +300°C (+572°F) with main requirements of low outgassing and minimum particle generation. Two Isolast® materials, J9650 and J9670 are proven to successfully operate at continuously elevated temperatures while withstanding aggressive chemicals and media. Other leading edge options for this environment are based on our engineered plastic and metal technology, proprietary products Turcon® Varilip® PDR and Wills Rings® being an ideal choice.

Relative weight loss of various elastomers
Temperature range: +50°C to +320°C (+122°F to +608°F)
detected with GC/MS



Seals recommended for semiconductor applications:



O-Rings

Busak+Shamban offers a wide range of O-Rings that balance cost-effectiveness with performance. Any size of O-Ring is available (standard or custom), in materials ranging from basic elastomer grades to leading edge compounds specifically developed for the industry.

V-Ring®

A unique all rubber seal for rotary shafts, it offers the perfect solution to prevent ingress of media including dirt, dust and water while retaining lubricant. Typical applications are on chemical mechanical polish or wafer dicing equipment, where it operates at a velocity up to 12 m/sec (39 ft/sec).

Varilip® PDR

These seals consist of a PTFE based Turcon® sealing lip retained in a crimped or clamped metal case. They are ideal for use in process pumps where they prevent gearbox oil from entering the processing system and allow the introduction of an inert gas barrier.

Variseal®

Variseal® spring energized PTFE based Turcon® seals have been used in the most demanding of semiconductor sealing applications including vacuum and corrosive environments. They are field proven to give high sealing integrity in extreme gas and liquid handling situations.

Literature at:

www.busakshamban.com/groove



Go to the Shop!

Materials recommended for semiconductor applications:



Wills Rings®

The original metal seals, Wills Rings® provide the optimum solution in static sealing on connectors, flanges and plates for gases and liquids under extreme conditions. They operate in temperatures from cryogenic up to +850°C (+1562°F) and in pressures from hard vacuum and up to 1000 MPa (145038 psi, 10000 bar).

Pneumaseal

Pneumaseals are inflatable seals, of tubular elastomer; they are activated by internal pressurization. These are ideal for load locks and access doors including cleanroom doors, where they replace traditional flat gasketing and O-Rings, giving improved integrity in these specialized applications.

Bonded to metal

Busak+Shamban effectively bonds FKM and Isolast® seals to surfaces such as stainless and mild steel, aluminum, brass and various plastics. The major advantage of this is that it maximizes sealing integrity and prevents contamination in groove voids. It also eases assembly and reduces inventory.

Isolast® Fab Range™

High performance perfluoroelastomers specially designed for semiconductor use, they are virtually inert and have almost universal chemical compatibility. With a continuous operating temperature up to +315°C (+599°F), they are ideal for upstream solutions such as wet processing systems and in plasma.

Elastomers

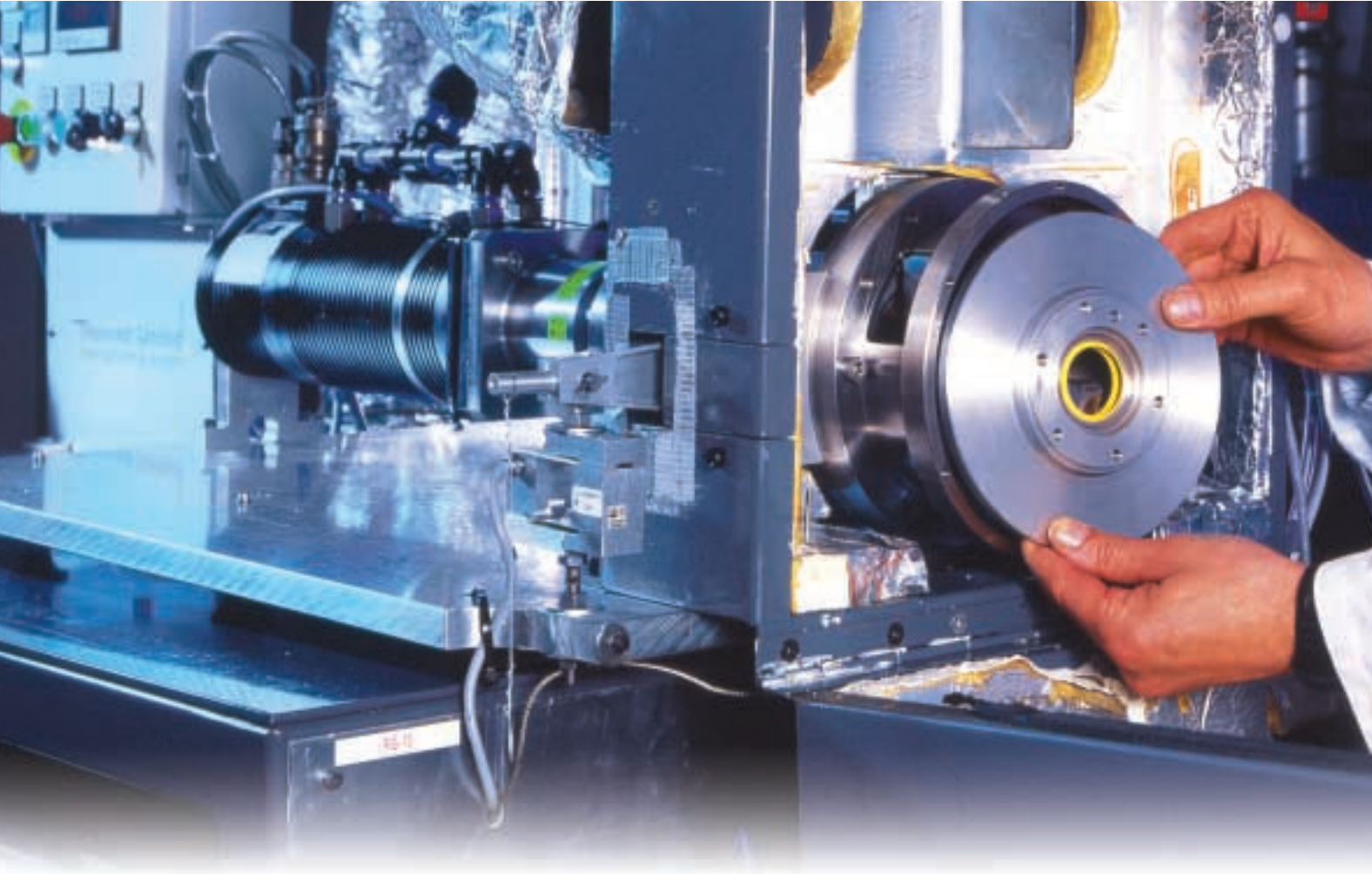
Fluoroelastomer (FKM) seals are ideal for downstream applications such as vacuum pumps and in wet processing where temperatures do not exceed +220°C (+428°F). They give excellent resistance to many semiconductor chemicals, while offering high purity, low permeation and outgassing levels.

Engineered thermoplastics

A variety of sealing options are available in engineered thermoplastics. These include novel solutions in PEEK™ and polyimide with good chemical and plasma resistance, electrostatic control and low outgassing. HiMod® wear rings and bearings have good dimensional stability and low particle shedding.

The range of Busak+Shamban products for the Semiconductor industry offers:

- Temperature resistance from cryogenic up to +850°C (+1562°F)
- Resistance to dry and wet process chemistry
- Excellent stability - thermal and within a vacuum or under pressure
- Extremely low levels of ionic impurities and TOCs (Total Organic Carbon)
- Minimal particle generation and outgassing, even at high temperatures
- Low permeation rates
- Reduced IR absorption and weight loss
- Good mechanical performance
- Low long term compression set



Working in a

Sealing to overcome the challenge of vacuum operation in semiconductor manufacturing equipment

Vacuum technology plays a critical role in semiconductor manufacturing, being key to process yield and productivity. Applications range from dry pumps to more complex subsystems for processes such as photolithography. Maintaining a consistent vacuum is vital, as even minor fluctuations can have a negative affect on the whole production cycle.

Effective sealing is an important element in achieving this. Seals must not only be capable of sealing in a vacuum but also be able to

withstand corrosive gases, plasmas and aggressive media, often at high temperatures. Sealing is further complicated by possible exposure to condensables and gels with operation in oxidizing or reducing environments. They must demonstrate low levels of ionic impurities (anionic and cationic) and TOCs (Total Organic Carbon) with minimal particle generation, outgassing and permeation. On top of all of these requirements is the need for supply of often specialized seals to meet very short lead times, minimizing downtime.

A unique one-off purpose designed and built test-rig checks the performance of a Varilip® PDR seal

Unique test facilities ensure unique results

Neville Sleigh manages the Research and Development test facility at Busak+Shamban associated manufacturing company Trelleborg Sealing Solutions, Ashchurch in Gloucestershire, England. From there, much of the development work has been undertaken for a major global semiconductor equipment manufacturer. Neville explains what has been involved.

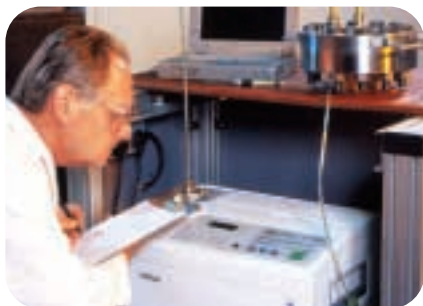
“When we started we were in unknown territory. As a company, we may have been providing sealing solutions for over fifty years but when it came to solving the challenges that semiconductor manufacturing presented, we faced something new.”

“Still though, basic principles of effective sealing could be applied. Finding a solution is all about defining the problem first. We worked with our customer to identify

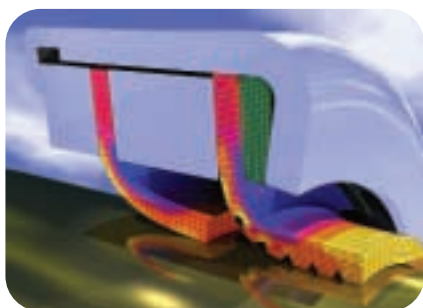
all those critical elements that might affect performance such as operating pressures, temperatures and types of media, gases and plasmas present within the system. Then we needed to know other criteria specific to the application. In the case of semiconductor equipment, that meant limitations on particle generation, outgassing, permeation, ionic impurities and TOCs.”

“To provide a unique solution, we required unique testing capabilities. Over the last 15 years the company has invested heavily in purpose designed and built one-off test rigs and undertaken extensive long-term testing in conjunction with our customers’ product development programs. This was combined with development work in the virtual environment using advanced FEA modeling. Through this methodology we were able to prove a range of solutions that are now effectively operating in semiconductor equipment globally.”

vacuum



Analysis of sealing integrity in vacuum conditions is carried out on a helium test rig



FEA modeling techniques were used to prove sealing solutions for high-speed semiconductor pumps and boosters

Recommended sealing solutions for vacuum conditions

Fluoroelastomer (FKM) seals

Low permeation and outgassing levels

Varilip® PDR

Custom designed they can include an inert gas barrier system

Variseal®

Operate at high vacuum in corrosive environments

Wills Rings®

Suitable for low and high temperatures at hard vacuum and up to 1000 Mpa (145038 psi, 10000 bar)

Sealing for a green

Busak+Shamban seals are used in rotary transmission 'lead-throughs', fitted into the tank filling systems.



Hydrogen filling stations, using WEH systems and including Busak+Shamban seals, are being built at a number of European locations.

Making hydrogen fueling possible

To make hydrogen fueling possible an effective filling system is required. Hydrogen is a very volatile fuel and extremely explosive when in contact with oxygen. A filling system must therefore make sure there is no chance of hydrogen mixing with oxygen, before it hits the fuel cell, if hydrogen fueling is ever going to be successfully implemented.

WEH is a leader in fueling technology

German company WEH has spent years developing filling systems for alternative fuels. The latest patented system from WEH offers the best possible safety for the user. The filling nozzle is connected tightly, until there is no pressure in the space between the inlet valve and connector.

Higher pressure, bigger sealing challenge

The higher the input pressure of a filling system, the faster the tanks can be filled. WEH is developing a system that can fill the tank at an even higher pressure than the current 450 bar (6525 psi). These pressures need high-performance seals, because the force to energize the seals must be as low as possible when the filling system is turned on.

Busak+Shamban seals selected

To meet operating requirements WEH chose a group of seals, including PTFE seals, O-Rings, Stepseal® and Glyd Ring® in conjunction with Busak+Shamban as their sealing partner. These seals use standard Busak+Shamban materials and also ones specially developed for this application, including some capable of withstanding temperatures as low as -40°C (-40°F).

alternative

The search is on for an alternative fuel to gasoline. Not only do governments want to lessen our use of fossil fuels, which are rapidly depleting, but they also want us to be greener. A major aim is to reduce the significant contribution vehicles have on global warming. The leading alternative at the moment is hydrogen fueling.

What about global warming?

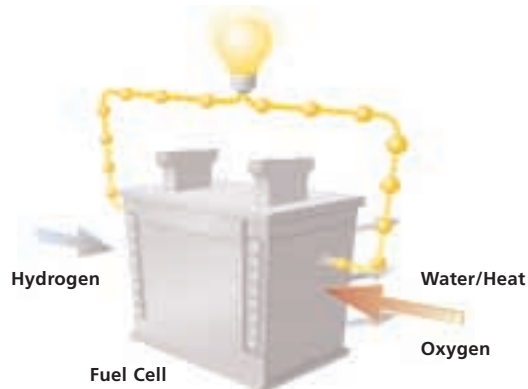
Global warming is caused by the collection of carbon dioxide emissions in the atmosphere. They act like a blanket, trapping in the sun's heat. The largest source of carbon dioxide pollution is coal burning power plants; the second largest source is vehicles. Over the past 50 years average global temperatures have increased at the fastest rate in history. The consequences of this could be catastrophic. Extreme predictions are that large areas of the world could become uninhabitable, with massive food and water shortages, sparking widespread migrations and war.

Is oil running out?

It is quite frightening when you realize how quickly we are using up the world's fossil fuel reserves, considering we are all so dependent on oil for energy and transport. "Peak oil" is the point at which half the total oil, known to exist, has been consumed. Once this has been reached, though demand for oil is still forecast to increase, production will steadily decline year on year. This will cause prices to rise, not just for oil but for its byproducts too. And at the moment estimates are for us to reach "peak oil" anywhere between now and 2020.

How hydrogen fuel cells work

A hydrogen fuel cell is a device that uses hydrogen and oxygen to create electricity. The type of fuel cell typically used in automotive applications is a Polymer Electrolyte Membrane (PEM). In this, hydrogen fuel is channeled through flow plates to an anode on one side of the fuel cell while oxygen is channeled to a cathode on the other side of the cell. At the anode the hydrogen is split into positive hydrogen ions (protons) and negatively charged ions (electrons). The protons pass through the Polymer Electrolyte Membrane (PEM) directly to the cathode while the electrons are forced along an external circuit to the cathode, creating the electrical current used for vehicle propulsion. At the cathode the protons and electrons mix with the oxygen to form water, which flows out of the cell. Totally green, hydrogen fuel cells produce electricity with only water and heat as byproducts.



A hydrogen fuel cell uses hydrogen and oxygen to create electricity for vehicle propulsion.

Isolast® J9503



is the champion

One of our customers, a chemical manufacturer, put Isolast® seals through some of the most demanding tests ever, for seals of this kind. Against all competition, they proved to be the winner, performing better than any other FFKM material tested, in these chemical immersion trials.

Isolast® performs well in demanding tests

The chemical company's tests involved keeping Isolast® J9503 along with other competitive FFKM compounds, immersed in various extremely aggressive chemical media for 112 days, at varying temperatures. After this time, the material volume was measured. A volume increase of 20% is classed as a 'critical threshold value' for seals in this type of experiment. Beyond that, the sealing material would not be considered suitable for sealing in a chemical media, at the temperatures where a volume change above 20% was seen.

Isolast® J9503 proved to be an outright winner

Isolast® J9503 proved to be an outright winner in these independent tests to find the best performing perfluoroelastomer from a range of FFKM materials. Isolast® J9503 offered the best value in terms of cost and performance compared to all other perfluoroelastomers tested.

Material leaflets at:

www.busakshamban.com/groove



Go to the Shop!

The Isolast® Range

Perfluoroelastomers were originally developed to meet the needs of chemical processing companies for a sealing material that had the elasticity of a Fluoroelastomer but the chemical resistance of a PTFE material.

The Isolast® range of materials are perfluoroelastomers specifically developed by Busak+Shamban for the manufacture of seals. They are resistant to virtually all chemicals and have operating temperatures from -25°C to +325°C (-13°F to +617°F).

The range gives real benefits and cost advantages by providing optimum seal reliability and extending service life. Seal performance is further enhanced by superior hysteresis and compression set characteristics, which ensures high elasticity and dynamic recovery, minimizing risk of seal failure.

Compounds are available that have been specially developed to meet the specific requirements of various industries, including general chemical, oil and gas and semiconductor processing. They are produced as standard and non-standard O-Rings, custom molded designs and bonded products. If required parts can be manufactured in cleanroom conditions, washed and packed to class 100 standards.

Tests were in the following media and temperature ranges:

- Hot aniline up to +184°C (+363°F)
- Nitrotoluene up to +175°C (+347°F)
- O-dichlorobenzene (ODCB) up to +180°C (+356°F)
- Ethylene diamine (EDA) up to +100°C (+212°F)
- Chlorosulfonic acid (CSS RT)
- 20% solution of hydrochloric acid up to +108°C (+226°F)
- Sulfuric acid and sulfuric acid compounds at a solution up to 87% up to +175°C (+347°F)
- 65% nitric acid at between +50°C (+122°F) and +122°C (+252°F)
- Hot air at +180°C (+356°F)

	Isolast® J9503	Competitive FFKM
Hardness +/- 5	75 Shore A	75 Shore A
Color	Black	Black
Specific Gravity g/cm3	1.94	2.00
Tensile Strength MPa N/mm ²	12.5	22
Elongation at Break	120%	192%
Compression set 72 hours at +200°C (+392°F)	25%	25%
Continuous Service Temperature:		
Maximum	+240°C (+464°F)	+320°C (+608°F)
Minimum	-25°C (-13°F)	-15°C (+5°F)
TR10 Point	-18°C (-0.4°F)	-5°C (+23°F)
Chemical immersion 112 days	% volume increase	% volume increase
	0 25	0 25
Aniline, +184°C (+363°F)		
Nitrotoluene, +175°C (+347°F)		
ODB, +180°C (+356°F)		
CSS, RT		
20% HCL, +108°C (+226°F)		
87% H2SO4, +175°C (+347°F)		
78% H2SO4+ Nitro dilution, +175°C (+347°F)		
65% HNO3, +50°C (+122°F)		
65% HNO3, +85°C (+185°F)		
Air, +180°C (+356°F)		

ODB = Ortho Dicloro Benzene, CSS = Chlorosulfonic Acid

Summary of results

- Isolast® J9503 had the lowest volume change of all perfluoroelastomer tested in all chemicals
- Volume change of Isolast® J9503 was below 20% at all temperatures in aniline, nitrotoluene, o-dichlorobenzene, chlorosulfonic acid, hydrochloric acid, nitric acid
- In many of these chemicals the volume change of Isolast® J9503 was in fact, below 10%
- Isolast® J9503 had the widest chemical resistance of all perfluoroelastomers tested

Great things

come in
small packages

Order your **FREE**
Sealing Solutions Toolkit at

www.busakshamban.com/groove



Order your Free Sealing Solutions Toolkit now!

Busak+Shamban is one of the leading sealing solutions experts in the world. To make the job of engineers specifying seals in their components easier, we have put together a pack of tools that no design or application engineer should be without. All of them are aimed at making your job simpler and saving you time.

What the pack contains:

O-Ring Calculator

The CD version of our acclaimed O-Ring calculator makes specifying the correct O-Ring for your application easy. It includes a sizing capability, recommendations on design parameters and complete measurements. Using a great deal of 'sealing expertise', the calculator even takes into account compression, seal expansion and groove fill. Really simple to use, its unique functions enable you to calculate the right seal every time.

Semiconductor Glossary

Ever wondered what the arhenius plot is or whether there is zeta potential. Find out in our handy Semiconductor Glossary where we explain the meaning of words used in the semiconductor industry. This book is specially produced by Busak+Shamban, in conjunction with Jerzy Ruzyllo, a renowned expert in the area of semiconductor materials, processes and devices. A useful publication to make life easy.

Expert on Demand

Are you looking for a sealing solution to fit your needs? The engineers at Busak+Shamban are ready to meet this challenge. This voucher entitles you to a free consulting talk. Give us a call, and we'll provide the expertise.

Expert on Demand

Lunch and Learn Voucher

Our latest literature

O-Ring Calculator

Semiconductor Glossary

Lunch and Learn Voucher

Let's meet for a 'Lunch and Learn'. We will take your engineers through the basics of sealing technology. Contact us for your tailor-made training. All that and we'll provide the lunch too!

Our latest literature

In the Toolkit you will also find the latest literature relevant to your market. We will send you brochures on our semiconductor and oil & gas sealing capabilities, along with material data sheets on our Isolast® range.

To order your Sealing Solutions Toolkit go to www.busakshamban.com/groove and click the Sealing Solutions Toolkit symbol. Or email us directly on groove@busakshamban.com, to make your request.



From Russia with oil

New Moscow office expands Busak+Shamban presence in Eastern Europe

Busak+Shamban is strategically expanding our presence in Eastern Europe, primarily to support our customers in the expanding Russian oil and gas market. An already recognized supplier to this region, to more effectively serve the equipment manufacturers and oil and gas field developers, we are establishing a new Russian office, based in Moscow. Up and running from January this year, it will initially operate with the help of personnel from the Bulgarian marketing company. The main objective will be to recruit Russian engineers to work with designers and field engineers locally, advising them on the right sealing solutions for their specific applications.

“Busak+Shamban is one of the largest global sealing developers and manufacturers in the world”, Manager of the Moscow office, Yordan Vassilev, explained, “but we feel it is vital that service and support is provided at a local level. Our experience as an International company is that we must never lose sight of our roots. When it comes to developing individual solutions it is important that we are close to the specifiers, not only in terms of location but in language and culture too. That is how we have succeeded so far and that is how we intend to succeed in the future.”



Russia to increase oil & gas production

Around 70% of Russia's production is exported as crude oil, much transported to Eastern Europe via its major export pipeline, the Druzhba (meaning friendship). Approximately 30% of crude oil is refined locally in Russia's forty plus refineries.

Russia's 1680 trillion cubic feet (Tcf) of natural gas reserves is nearly twice that of the next largest country, Iran. The majority of gas production is through three major fields (called the 'Big Three') in Western Siberia - Urengoy, Yamburg, and Medvezh'ye. Historically most natural gas exports were to Eastern Europe but this has diversified with supply now to the EU and emerging markets of Turkey, Japan and other Asian countries.

Russia is expected to significantly increase oil and gas production, along with crude exports by 2015. The expansion of gas production will be primarily through the development of new fields with transportation eased by the Northern Gas Pipeline, linking Russia directly with Germany.

The Russian oil and gas industry

Russia has the largest natural gas reserves in the world and the eighth largest oil reserves. It is now the world's largest exporter of natural gas and the second largest oil exporter; its economic growth over the last five years primarily being fueled by its energy exports.

Oil reserves in Russia are known to be around 60 billion barrels, most of which are located in Western Siberia, between the Ural Mountains and the Central Siberian Plateau. In 2004 liquids production was just above 9 billion bbl/d with only Saudi Arabia producing more crude oil during that year.



The new marketing team in Moscow has already made their presence known in Russia. They exhibited at last year's International Oil and Gas show and this year plan to exhibit at NEF Gas.



Oil & Gas brochure at:
www.busakshamban.com/groove



Go to the Shop!

Gaining the seals of approval

Busak+Shamban has a range of seal materials that comply to Norsok M-710 standard

Busak+Shamban has been a leading supplier of sealing solutions to the oil and gas industry for over twenty-five years. To support their customers supplying the Norwegian oil and gas industry in gaining Norsok approval for their assemblies, Busak+Shamban has had a number of sealing materials tested to Norsok standards.

We can now offer the largest range of sealing materials with certificates of compliance to Norsok M-710, available from any seal developer and manufacturer. And most of these are already proven and in long-term use in many demanding exploration, offshore and onshore production, upstream and downstream environments.

Bill Allan, Busak+Shamban Oil and Gas Segment Manager says, "We are thrilled to have been so successful in these tests. The availability of compliant materials will make it easier for existing and new customers to achieve full approval for their assemblies from Norsok."

The sealing materials are available in a range of seal types. The PTFE based materials are commonly used in the industry in the form of Turcon® Variseal®, back up rings and support rings.

Details of tests:

A number of grades of Busak+Shamban polymers were involved in rigorous independent tests, undertaken and supervised by MERL - materials engineering research laboratory, a respected independent laboratory in the United Kingdom. The main focus of the testing was to predict service life of the materials within an offshore working environment, as specified in Norsok M-710 standard, Annex C. Ideally materials should exceed expected well production lifetime of an oil and gas facility of 30 years.

Thermoplastic sealing compounds, PTFE based grades and PEEK based materials, were immersed in a sour (2% H₂S) multi-phase fluid at +200°C to +220°C (+392°F to +428°F), for periods of 7 to 70 days. After saturation in this liquid the mechanical properties, including tensile strength, elongation Young's modulus and volume changes, were measured. These results were used to predict ageing and estimated service life of the materials.

Summary of results:

All eleven thermoplastic materials tested met Norsok acceptance criteria, showing them to have good chemical stability. Changes in tensile strength remained well within the Norsok acceptance range for thermoplastics and all easily exceeded the 30 year expected well production lifetime.



MERL report relating to NORSOK M-710 standards for Busak+Shamban materials.



The NORSOK Standards

The Norwegian petroleum industry has developed the NORSOK standards to ensure safety, add value to and improve cost effectiveness of petroleum industry developments and operations.

Usually the NORSOK standards are based on recognized international standards with modifications to specifically meet the needs of the Norwegian petroleum industry. One of the objectives of these standards is to contribute Norwegian knowledge to improve international standards.

Different from previous approvals, is that all individual components within an assembly must meet and be approved to NORSOK standards, rather than just the complete assembly.

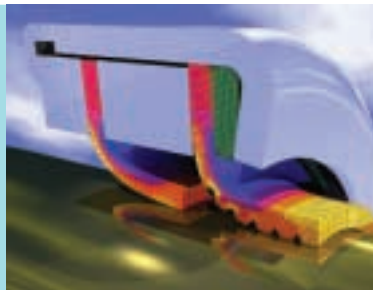
The preparation and publication of the NORSOK standards is supported by OLF (The Norwegian Oil Industry Association) and TBL (Federation of Norwegian Manufacturing Industries). NORSOK standards are managed and issued by Standards Norway.

Benefit^{plus} – what does it mean?

A seal or molding may only appear to be a minor part of a component but they are critical to its operation. Not only is the seal's function important but also the support that goes along with their supply

Many seal manufacturers would like to supply seals for cleanroom applications. Only a few manufacture them in one.

Long before seals are manufactured, the results of the design work are verified with the aid of the FEM.



Benefit^{plus} – what does it mean? Benefit^{plus} is the little bit extra Busak+Shamban does that makes us different from other seal suppliers. It is about our service. About that added something, that is often unseen but which can add real benefits to you, our customer.

Pioneering Research

Busak+Shamban is a leader in sealing technology. Research and Development facilities at six important locations worldwide aim at matching new products to industry needs. Our materials laboratories continue to add to the current range of more than 2,000 proprietary compounds. Expertise in polymers shortens the lead-time between identification of a specific requirement and formulation of a new material to meet it, reducing our customers' time to market.

Visit us at:

www.busakshamban.com



Development support

We work with our chemical processing customers from concept stage to production. Rapid product design is helped by use of the latest computer design and modelling systems, fully customer-compatible CAD systems and leading edge Finite Element Analysis (FEA). In-house prototyping means samples and urgently needed spares can be fabricated quickly. Test sites prove manufacture in volume before supply to customers.

On-line services

Busak+Shamban is making it easy to design and specify seals, on-line. Our simple O-Ring calculator, with unique functions, allows you to easily specify the correct O-Ring for your application. With the CAD On-line service, at the click of a mouse, you can download seal profiles to use in component designs. These free of charge programs are compatible with all commonly used CAD systems and save users design time.

That little bit extra!

Pioneering Research

Our technology and expertise shortens time to market

Development support

Accelerated design, with support from product concept

On-line services

Easing your design process at the touch of a mouse

Industry expertise

Working closely with customers speeds solution development

Effective delivery

No hold ups and downtime waiting for product

Continuous improvement

Quality assurance ensures production efficiency



Our supply chain includes an efficient logistics center delivering on-time shipments.

Industry expertise

Busak+Shamban focuses on important industries. A dedicated chemical processing team, covering the chemical industry, oil and gas, food and beverage production, pharmaceuticals and semiconductor manufacturing, works from our head office in Stuttgart. They identify the global industry needs and make sure that products, materials and services are developed to match the market requirements. Key accounts are globally co-ordinated with local contacts at our marketing companies worldwide.

Effective delivery

The amount of variations of seals Busak+Shamban can supply is almost uncountable. This means that effective logistics are vital to ensure that the correct product is delivered to our customers on time. A company-wide computer system is at the center of our supply chain management, linked to our strategically-placed logistics

centers globally and directly to some of our customers. Our track and trace facility means we know exactly where goods are once despatched and we can even accelerate delivery in transit, if necessary.

Continuous improvement

For us, quality is a given. To ensure this, global facilities are certified and continuously monitored to a variety of international standards including BS EN ISO 9001:2000, QS 9000, AS 9000, VDA 6.1 and TS 16949.

We work with customers to prove their applications in our test facilities and have a range of materials and products that meet the specific standards of the chemical industry. This includes FDA, USP Class VI for food and pharmaceuticals, special water processing approvals and others such as NORSOK for oil and gas.

Busak+Shamban at a glance

Contact the editorial team: groove@busakshamban.com

- Part of Trelleborg Sealing Solutions, a business area of the Trelleborg Group
- Employees: 6000 (Trelleborg Sealing Solutions)
- Research and Development Centers in Europe and America
- 30 manufacturing plants worldwide
- Quality Certifications: ISO 9001, QS 9000, VDA 6.1
- 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:
www.busakshamban.com

