Chemical, Pharmaceutical, Food and Beverages

Sealing in high-purity, deionized water – no problem!

Semiconductor
Long seal life – whatever the conditions – Isolast® Fab Range™

Oil & Gas
Three material grades stand up to the pressure
Contents

Editorial 3
News 4

CPI

Coping with the purity of water
Two EPDM grades outperform all other elastomers in high-temperature, high-purity water

Milk Fat makes the difference
Tests prove EPDM grades E7502 and E7518 perform well in dairy applications

Turcon® MF - A dynamic problem solver with no aftertaste
The proprietary Turcon® MF family is the ideal sealing solution for hygienic applications

Busak+Shamban successfully bond perfluoroelastomers to metals
Busak+Shamban achieves a reliable bond between FFKM perfluoroelastomer and metal

Semicon

Isolast® Fab Range™ – Specialists in Electronic Manufacturing
Busak+Shamban range specially developed to withstand the extreme conditions in semiconductor processing

Oil & Gas

Solution found to seal degradation in water-based drilling equipment
In tests, seal material withstands biocides and corrosion inhibitors and high-pressure cycles

Ensuring downhole integrity
Cableless gauge is brought one step nearer to reality with Busak+Shamban sealing technology

Extras

Trelleborg Centenary
Our parent company, Trelleborg AB celebrates their 100th anniversary

Benefitplus – what does it mean?
That little bit extra that makes Busak+Shamban different from the competition
Having been involved in the chemical processing industry for a number of years now, I still find it hard to believe how rapidly it changes. As seal manufacturers and developers, one of our biggest challenges is to keep up to date with these changes. That is the only way we can make sure that we provide the right products and materials for the industry. We have devoted much of this issue of *in the groove* to show how Busak+Shamban invests heavily in research and development, to identify the right product for specific applications. This was the case when we found an effective seal material to cope with the highly destructive effect of high-temperature deionized water on seals, check out our article ‘Coping with the purity of water’.

Test results can sometimes produce surprising results. EPDM seals were thought not to be suitable for milk fat processing. In our article ‘Milk fat makes the difference’, read how our research proved that certain EPDMs could be successfully used in contact with milk fat, dependent upon the fat content.

No single polymer has proved capable of sealing in the varying conditions found in semiconductor processing equipment. If you want to know more on the range of products developed to solve this problem, read about the Isolast® Fab Range™.

I hope you enjoy our first issue of *in the groove*. We would be grateful of any feedback you may have. Why not e-mail us at groove@busakshamban.com with your comments.

Dr. Sandro Silverio
CPI Segment Director Europe
Sealing is difficult in the vacuum mixing and homogenizing equipment used in pharmaceutical and cosmetic production. Ordinary elastomer O-Rings cannot retain integrity when in contact with the harsh chemicals used in CIP (cleaning in process) and SIP (sterilization in place), especially at extreme temperatures. The O-Ring, in these applications, must move a little in an axial direction but after the cleaning processes, elastomer O-Rings tend to stick within the groove housing.

Our research and development teams have proved that FEP O-Rings can solve this problem. FEP O-Rings consist of an elastomer inner ring with a seamless cover of FEP around it. Elasticity is given by the elastomer O-Ring and chemical resistance by the seamless FEP cover. This solution is able to cope with harsh cleaning procedures, to operate at pressures from vacuum to 300kPa (43.5 psi) and tolerate temperatures up to 155ºC (311ºF). The FEP encapsulation gives reduced friction force, resistance to abrasion and excellent resistance to most liquids and gases. It also conforms to FDA regulations. So our engineers advice for sealing integrity in these conditions - keep it covered!
Busak+Shamban has been in the seal business for over fifty years and we can truly say that nobody does it better. Our global coverage is unrivalled and our range of products, especially proprietary ones, is unbeatable. Wills Rings® are the original metal O-Rings and we pioneered much of the PTFE technology used in sealing today. Our name might have changed over the years but whether you knew us as Dowty, Shamban or by one of our other brands, Stefa, Skega, Orkot® or Isolast®, we are undoubtedly one of the leading sealing suppliers in the world.

Contamination at connections in pipe work is a major concern in pure-product processing in food, pharmaceutical, cosmetic, medical and biotechnology industries. Busak+Shamban has developed high performance ferrule gaskets for installation in these applications. Engineered from our FDA compliant Isolast® plus material, the focus of the design was on sealing integrity, resistance to aggressive media, an ability to withstand temperature extremes and purity of seal material. The ferrule gaskets minimize contamination and bacterial ingress. They are proven to be thermally resistant from -15°C (23°F) to 250°C (482°F), have almost universal chemical compatibility, including with CIP and SIP media, are FDA and USP Class VI compliant and, with an extended seal life, reduce maintenance costs and downtime. For absolute product purity, there is even the option of manufacturing and packaging in a cleanroom environment.

Can we ever remember life without the Internet, when the only mouse in the house, was the one the cat used to chase? The Internet has become an essential information tool. Busak+Shamban sees the web as a vital link between our customers and ourselves. It is regularly updated with news on the company, the latest developments on products and materials and has an area to download our latest technical brochures and sales literature. The website has also become the platform for a couple of essential tools to make the designer's life easier. Our simple O-Ring calculator, with unique functions, allows the designer to easily specify the correct O-Ring for their application. While 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.

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.
Coping with the purity of water

Two EPDM grades outperform all other elastomers in high-temperature, high-purity deionized water

Minimizing degradation of these seals is important, as this may affect the quality and purity of the processed product. In co-operation with a leading international pharmaceutical manufacturer, Busak+Shamban set out to find the best material for use with heated, high-purity water. In a long-term test, a selection of seven materials was exposed to separated deionized water from the pharmaceutical manufacturer’s processing...
CPI

EPDM grades E7502 and E7518

- Test results prove grades operate in most aggressive CIP media
- Compliant to 21 CFR 177.2600
- USP Class VI, cytotoxicity and 3-A approval
- Show excellent compatibility with high-purity water (WFI) and steam up to 180°C (302°F)

System for 84 days at 90°C (194°F). The materials tested were three ethylene propylene diene rubbers (EPDM - E7002, E7502 and E7518), two fluorocarbon elastomers (FKM - V8605 and V04/07), and two Isolast® perfluoroelastomers (FFKM- J9515 and J9516).

Compliant with important approvals

All met the requirements of FDA Guidelines 21 CFR 177.2600 or 21 CFR 177.2400 and three of the materials in the EPDM and FFKM material groups were approved to USP Class VI. Materials specialists measured the effect of the test environment on the hardness, weight, volume, elongation and tensile strength of each material. Results of the tests revealed that two of the EPDM materials, E7502 and E7518, offered a greater resistance to high-temperature deionized water than the other materials tested, with swelling volume and changes in material elongation being minimal.

Grades give best-in-class results

These test results encouraged the pharmaceutical company concerned to immediately integrate seals manufactured from E7502 and E7518 compounds within processing equipment handling deionized water. These and previous impressive results already recorded for these materials in CIP (Cleaning in Place) media, demonstrate the suitability and benefits of specifying Busak-Shamban EPDM compounds E7502 and E7518 sealing materials, in any application where purity and media resistance are of vital importance.
Busak+Shamban has developed an unequalled database of over 2000 material formulations, based on elastomer, PTFE and thermoplastic technologies, including many high-performance polymers designed to operate in demanding environmental conditions at temperatures ranging from -254°C (19°F) to +325°C (598°F) with a variety of approvals.

Tests by seal developer and manufacturer Busak-Shamban, clearly demonstrate that two of their specialized EPDM materials offer greater resistance to the destructive effects of high-purity water, than other commonly used seal materials.
Busak+Shamban has proved that EPDM seals can be used in the processing of liquid milk products, even though they were previously believed not to be suitable in this application. EPDM seals offer significant advantages over the silicone and HNBR seals traditionally fitted in milk processing systems. They have resistance to the now commonly used CIP (Cleaning In Place) regimes and hot, high purity water which cause the seals to degrade and make frequent replacement necessary.

Tests prove EPDM grades E7502 and E7518 perform well in dairy applications.

Milk fat makes the difference

Tests highlight the difference

These conclusions came from a detailed study undertaken by Busak+Shamban into the performance of various sealing materials used with milk products of fat content ranging from 3.5% to 82% - Fresh full-cream milk (3.5%), Sour cream (24%), Whipping cream (30%), Half-fat butter (39%), Top-quality butter (82%) and Olive Oil, with a fat content of 100% for comparison purposes.
Samples of six elastomeric compounds, two EPDM (Ethylene-propylene-diene rubbers - E7502, E7518), one FKM (Fluorinated elastomer material - V8605), one HNBR (Hydrogenated acrylonitrile-butadiene rubber - H7501), one Acrylonitrile-butadiene rubber (N7027) and one VMQ (Silicone rubber - S70R8) were included in tests complying with DIN 53521. Each material was stored in the selected oil or milk product for a period of 336 hours at 40°C (104°F) and measurements of the hardness and changes in weight and volume of the materials, and of the alterations in their elongation at break and tensile strength, took place after completion of the test period. The main parameter measured, which is the critical factor that influences performance of a seal material in the processing of oil and milk fats, was the volume expansion of the sealing material. Seals in sterile applications must have a ‘zero dead space’ installation and this may be compromised if the seal extrudes, after expansion.

Contradicting prevailing opinion, Busak+Shamban has proved that specially formulated EPDM seals made from E7502 or E7518 can be suitable for use in the processing of liquid milk products.

**EPDM grades E7502 and E7518**

- Test results prove grades are suitable for liquid dairy products
- Compliant to 21 CFR 177.2600 and 3-A
- Both grades resistant to virtually all commercial CIP media

Full test results at: [www.busakshamban.com/groove](http://www.busakshamban.com/groove)
The main material used for sealing in hygienic processes, in products such as screwed pipe joints or flanged joints, are elastomers. However, with the latest cleaning regimes, systems are now thoroughly degreased. So, when elastomer seals are used on parts moving against each other, they must operate in a dry running environment, where after long periods of shut-down, the friction coefficient may reach as much as $\mu=0.8$. In such applications, elastomers have a tendency to adhere to the surface they seal, damaging the seal and reducing component performance. In these dynamic situations, a sealing material is required which offers high resistance to chemicals and good friction characteristics. The solution is seals manufactured from the Busak+Shamban proprietary PTFE material Turcon® MF.

The proprietary Turcon® MF family is the ideal sealing solution for hygienic chemical, pharmaceutical food & beverage applications.
The Turcon® MF range of materials is specially formulated for dynamic hygienic applications. Being almost universally chemically resistant, they are compliant with FDA regulations and the EC Plastics Directive.

Their excellent friction characteristics negate the risk of adhesion and being operational at elevated temperatures up to 260°C (500°F), they are suitable not only within processing systems subject to CIP (Cleaning In Place) but also to SIP (Sterilization In Place) regimes. In addition, the materials will not effect the taste of media processed, even when in contact with sensitive mineral waters.

All grades of Turcon® MF are available in a variety of standard and custom product types, both linear and rotary. These include Turcon® Variseal® as well as its special derivatives - ‘High Clean’, ‘Sanitary’, Roto - Turcon® Glydring® and Turcon® Varilip®, along with guide bushes, scrapers, Excluder® and custom designs.

### Selection Table

<table>
<thead>
<tr>
<th>Material code</th>
<th>Description</th>
<th>Color</th>
<th>Temp. max</th>
<th>Characteristics</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turcon® MF1</td>
<td>Virgin PTFE</td>
<td>White</td>
<td>260 °C 500 °F</td>
<td>• Lowest friction</td>
<td>• Very well suited to static applications or those with only occasional movements</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Limited resistance to wear and extrusion</td>
<td>• For soft opposing surfaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Good sealing characteristics</td>
<td></td>
</tr>
<tr>
<td>Turcon® MF3</td>
<td>PTFE with modified mineral fillers</td>
<td>White</td>
<td>260 °C 500 °F</td>
<td>• Medium wear resistance</td>
<td>• Linear and rotating dynamic applications</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Good sealing characteristics</td>
<td>• Soft to hard opposing surfaces (&gt;170 HB)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• No risk of product discoloration</td>
<td></td>
</tr>
<tr>
<td>Turcon® MF4</td>
<td>PTFE with carbon fibres</td>
<td>Dark grey</td>
<td>260 °C 500 °F</td>
<td>• High wear resistance</td>
<td>• Linear and rotating dynamic applications</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Excellent dynamic capabilities even in aqueous products</td>
<td>• For products which provide poor lubrication</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Moderately hard opposing surfaces (&gt;25 HRC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Not recommended for use as a gas seal</td>
</tr>
</tbody>
</table>
Busak+Shamban has achieved what was thought to be impossible, a reliable bond between FFKM perfluoroelastomer and metal.

Sealing devices which have a rubber lip, pad or membrane, bonded to a metal component are often used when space is restricted or to avoid groove voids, stopping associated problems such as bacterial build up and contamination. If a FFKM seal is required in an application to withstand aggressive chemicals or high temperatures, the chemical resistance of perfluoroelastomer means a successful bond cannot be made with conventional glues and the integrity, essential in critical CPI applications, cannot be guaranteed.

A development from Busak+Shamban allows us to bond Isolast® FFKM to a wide range of surfaces, including stainless and mild steel, aluminium, brass and various plastics. In fact, laboratory and field-testing has proved the integrity of the bond to be greater than the tensile strength of the perfluoroelastomer itself and immersion tests in a range of chemicals, including Acetic Acid, Methyl Ethyl Ketone (MEK) and Sulphuric Acid at elevated temperatures, show the bond to be resistant to chemical attack. Following immersion, bond strength proved to be equally as high as it was before the soak tests began and the bonding action did not affect the physical performance properties nor the general chemical resistance of the perfluoroelastomer. Semiconductor, medical, pharmaceutical, food and beverage industries have adopted this advanced sealing technology. With seals manufactured from Isolast® FDA approved grade J9515 and J9516, the aggressive cleaning fluids required within CIP and SIP processes can be used without fear of leakage.

An added benefit is that metal bonded to Isolast® perfluoroelastomer can save money by reducing the number of parts handled and stored and increased speed in sub-system assembly. Recent application examples have shown the use of Isolast® perfluoroelastomer bonded seals to offer a full 50% cost saving when replacing conventional sealing arrangements.

**Benefits from Isolast® bonded seals**

- Reduced costs
- Increased ease and speed of assembly
- Lower inventory costs
- Improved sealing integrity
Even though the company has reached its centenary, some things never change - like a passion for finding new solutions to complex problems. That is the way it was in 1905 when industrialist Henry Dunker founded Trelleborgs Gummifabriks AB, producing bicycle tires and industrial rubber products. And that is the way it is today - 100 years later.

From humble beginnings at the start of the last century as a small rubber-production plant on the South Coast of Sweden, Trelleborg took a huge step to evolve into a successful, technologically advanced organization, with the world as its workplace; a world leader in polymer materials and high-technology solutions, globally employing 22,000 people in 40 countries. Tires and raincoats have been replaced by a myriad of niche products for the agricultural, forestry, aviation, construction, automotive, infrastructure and offshore oil industries, solutions adapted to the tough challenges and extreme demands of the forces of nature. Polymer expertise remains the foundation of operations but the company’s structure and products have developed and adapted to today’s society, in a way that Henry Dunker, could hardly have dreamt. A background of innovativeness, technological development and endeavor for quality has given Trelleborg the experience needed for the future. The Group’s five business areas - Automotive, Sealing Solutions, Engineered systems, Wheel systems and Building systems - now hold leading positions in their world markets and their inventive solutions for damping, protecting and sealing are utilized in more applications than imaginable. To the Trelleborg group, quality is a state of mind and it adopts an in-depth approach to each problem, aiming to provide long-term solutions. Yesterday’s and today’s innovations, expertise and quality form the foundation of tomorrow – Quality is Timeless.

Busak+Shamban has the backing of one of the world’s foremost experts in polymer sealing technology. We are the global sales and marketing organization of Trelleborg Sealing Solutions who develop, manufacture and market safety-critical polymer-based precision seals and associated systems. And this year, our parent company, Trelleborg AB, celebrates their 100th anniversary.

Further information at:
www.trelleborg.com
The Isolast® Fab Range™
Specialists in Semiconductor Manufacturing
The high technology equipment used in the semiconductor industry is often processing aggressive wet chemicals or plasmas at extreme temperatures. This environment is very demanding on seals and molded components and no single polymer material can withstand all possible conditions.

This is why Busak+Shamban developed the Isolast® Fab Range™, perfluoroelastomer sealing materials specially engineered to meet the requirements of the semiconductor manufacturing industry.

All of the materials in the Isolast® Fab Range™ have been developed by Busak+Shamban materials personnel and show the company’s strong commitment to offer materials and products that match the different requirements of the electronics industry. The Isolast® Fab Range™ helps reduce downtime and improve production efficiency by extending seal life. All compounds are virtually inert and provide almost universal chemical compatibility. This gives real benefits and cost advantages in semiconductor applications.

Each of the Isolast® materials are designed for a specific application:

- **Isolast® J9610** for wet process applications, it has the highest level of chemical resistance.
- **Isolast® J9630** for aggressive mid-temperature plasma applications it demonstrates minimal outgassing and weight loss.
- **Isolast® J9650** for high temperature wafer processing applications it is of ultra-high purity.
- **Isolast® J9670** for high temperature plasma applications it has superior resistance to plasma erosion.

Manufactured and packed in a cleanroom environment, the Isolast® Fab Range™ materials are available in standard and non-standard O-Rings, custom molded designs and some as bonded products.
Perfluoroelastomers

are created from monomers that have had all of their hydrogen atoms exchanged for fluorine atoms. Since the chains of molecules are cross-linked with each other, perfluoroelastomers combine the elastic characteristics of elastomers with the chemical and thermal resistance, usually associated with PTFE.

Varilip® rotary shaft seals

are successfully proving themselves, especially in semiconductor process pumps. Here they prevent gearbox oil entering the processing system and allow the introduction of an inert gas barrier system.

To ensure purity in seal production, the Isolast® Fab Range™ are manufactured in cleanroom conditions, washed and packed to class 100 and double bagged.

Varilip® PDR rotary shaft seals are made up of a Turcon® PTFE sealing lip retained in a crimped or clamped metal case.

Seals and molded components are manufactured from extremely pure materials.

Isolast® J9610

Premium compound for wet process applications

Elastomer base:
- High performance perfluoroelastomer
- Ultra pure FFKM

Applications:
- Wet etch
- Wet cleaning
- Wet plating
- Wet stripping
- Photolithography
- Chemical mechanical planarization (CMP)

Features:
- Long-term universal chemical resistance up to 235°C (455°F)
- Long-term low compression set
- Ultra-high purity material
- Extremely low metallic cation extractables
- Minimal anion impurities and low level of extractable TOC (Total Oxidizable Carbon)
- Extended seal life means less downtime due to seal replacement
- Available in any size of O-Ring; standard or custom, flat rubber format or shaped gaskets
- Excellent sealing function provided by outstanding surface quality
- Can be bonded to metal

Compound data:
- Hardness: 75 +/- 5 Shore A
- Color: black
- Special gravity (DIN EN ISO 1183-1):
  1.94 +/- 0.03 g/cm³
- Tensile strength (DIN 53504):
  13.8 MPa - N/mm²
- Elongation at break (DIN 53504): 128%
- Compression set (DIN ISO 815 Typ B):
  72 h / 200°C (392°F): 17 %
- Service temperature (DIN ISO 1629):
  from -25°C (77°F) up to +235°C (455°F)
- ICP-MS analysis was carried out

Material leaflets at:
www.busakshamban.com/groove
The Isolast® Fab Range™

Premium sealing compound for the semiconductor industry

**Isolast® J9630**

- **Premium compound for plasma applications**
  - **Elastomer base:**
    - High performance perfluoroelastomer
    - Ultra pure FFKM
  - **Applications:**
    - Dry plasma etch
    - Oxidation
    - Chemical vapor deposition (CVD)
    - Plasma ashing
    - Diffusion
    - Metallization
  - **Features:**
    - Broad resistance in aggressive plasma and dry process gasses up to +260°C (500°F)
    - Minimal outgassing
    - Ultra-high purity material
    - Long-term low compression set
    - Available in any size of O-Ring; standard or custom
    - Excellent sealing function provided by outstanding surface quality
    - Can be bonded to metal
  - **Compound data:**
    - Hardness: 85 +/- 5 Shore A
    - Color: white
    - Special gravity (DIN EN ISO 1183-1): 2.57 +/- 0.02 g/cm³
    - Tensile strength (DIN 53504): 13.5 MPa - N/mm²
    - Elongation at break (DIN 53504): 185%
    - Compression set (DIN ISO 815 Typ B): 72 h / 200°C (392°F): 14%
    - Service temperature (DIN ISO 1629): from -15°C (59°F) up to +320°C (608°F)
    - ICP-MS analysis was carried out

**Isolast® J9670**

- **Premium compound for high temperature plasma processes**
  - **Elastomer base:**
    - High performance perfluoroelastomer
    - Ultra pure FFKM
  - **Applications:**
    - High temperature plasma processes
    - Dry plasma etch
    - Physical vapor deposition (PVD)
    - Chemical vapor deposition (CVD)
  - **Features:**
    - Almost universal chemical resistance in aggressive plasma and dry process gasses up to +315°C (599°F)
    - Minimal outgassing
    - Ultra-high purity material
    - Long-term low compression set
    - Available in any size of O-Ring; standard or custom
    - Excellent sealing function provided by outstanding surface quality
  - **Compound data:**
    - Hardness: 75 +/- 5 Shore A
    - Color: black
    - Special gravity (DIN EN ISO 1183-1): 2.01 +/- 0.03 g/cm³
    - Tensile strength (DIN 53504): 18.3 MPa - N/mm²
    - Elongation at break (DIN 53504): 119%
    - Compression set (DIN ISO 815 Typ B): 72 h / 200°C (392°F): 14%
    - Service temperature (DIN ISO 1629): from -15°C (392°F) up to +320°C (608°F)
    - ICP-MS analysis was carried out

**Isolast® J9650**

- **Premium compound for high temperature applications**
  - **Elastomer base:**
    - High performance perfluoroelastomer
    - Ultra pure FFKM
  - **Applications:**
    - High temperature processes
    - Rapid thermal processing (RTP)
    - Diffusion
    - Chemical vapor deposition (CVD)
    - Dry plasma etch
    - Deposition
    - Diffusion
    - Metallization
    - Annealing
  - **Features:**
    - Excellent thermal resistance up to +320°C (608°F)
    - Ultra-high purity inert material
    - Extremely low metallic cation extractables
    - Minimal anion impurities
    - Excellent sealing function provided by outstanding surface quality
    - Available in any size of O-Ring; standard or custom
  - **Compound data:**
    - Hardness: 75 +/- 5 Shore A
    - Color: beige
    - Special gravity (DIN EN ISO 1183-1): 1.21 +/- 0.07 g/cm³
    - Tensile strength (DIN 53504): 18.3 MPa - N/mm²
    - Elongation at break (DIN 53504): 119%
    - Compression set (DIN ISO 815 Typ B): 72 h / 200°C (392°F): 14%
    - Service temperature (DIN ISO 1629): from -15°C (392°F) up to +320°C (608°F)
    - ICP-MS analysis was carried out

Seals manufactured and packaged in Class 100 cleanroom to QS 9000 quality standards (DIN ISO 14644 class 5); Material properties are average values resulting from tests, as specified, on standard test samples. The values are for guidance only. It is the responsibility of the user to test material for suitability within a specific application.
Solution found to seal degradation in water-based drilling equipment

Three grades of Isolast® successfully completed 1,200 pressure cycles up to 10,000 psi

Water-based media are being used as an alternative to oil-based drilling and completion fluids in the offshore industry for environmental reasons. As they are used at relatively high temperatures, they have the disadvantage of causing scale and bacteria to form within drilling equipment. To stop this, fluids are usually dosed with a chemical-based inhibitor. These are often amine-based and being highly aggressive, cause conventional elastomer seals to quickly degrade.

A leading manufacturer of valves for offshore equipment asked Busak+Shamban to find a seal material that would withstand biocides and corrosion inhibitors. The seals had to operate in 100% concentrations at temperatures ranging from -20°C (4°F) to 60°C (140°F). As carbon dioxide may be present and operating pressures are very high, they also had to have explosive decompression resistance (EDR) and extrusion resistance.

Already proven in other processing applications, three grades of Isolast® perfluoroelastomer material completed 1,200 pressure cycles up to 10,000 psi. These tests, specific to water-based drilling operations, showed the materials met all requirements.

Based on the results, Isolast® perfluoroelastomer seals are now giving longer seal life and reducing maintenance costs and downtime in offshore valve applications globally.
The industry has been trying to develop a cableless downhole gauge to measure downhole temperatures and pressures in oil and gas wells, for several years. The main advantage of cableless gauges over conventional systems, which use gauges connected by cables to the monitoring station, is that expensive cables and lengthy installation time are not required. Also, reliability is improved, as the cable causes most problems in operation.

A critical part of development has been the design of effective sealing between the steel outer housing and the central components, which dynamically control the sensitive instrumentation within the gauge.

In conjunction with gauge developer, the Expro Group, Busak+Shamban designed a sealing system employing a series of O-Rings with engineered back-up rings. This needed to withstand temperature and pressure variance in operation and provide long-term service. To make certain of this, Busak+Shamban development engineers chose a specialized grade of Isolast® perfluoroelastomer, as O-Ring sealing material.

Testing of the cableless gauge is complete and an effective sealing arrangement found. This takes the reality of the 'wireless well control and monitoring' concept, one step closer.

In exploration wells, sealing systems must withstand the harshest of environments, with downhole temperatures in excess of 180°C (360°F) and pressures possibly up to 155 Mpa (22,500 psi).
Benefit\textsuperscript{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\textsuperscript{plus} – what does it mean? Benefit\textsuperscript{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.

Further information at:
www.busakshamban.com/groove

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

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

**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.
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 polytetrafluoroethylene, 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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