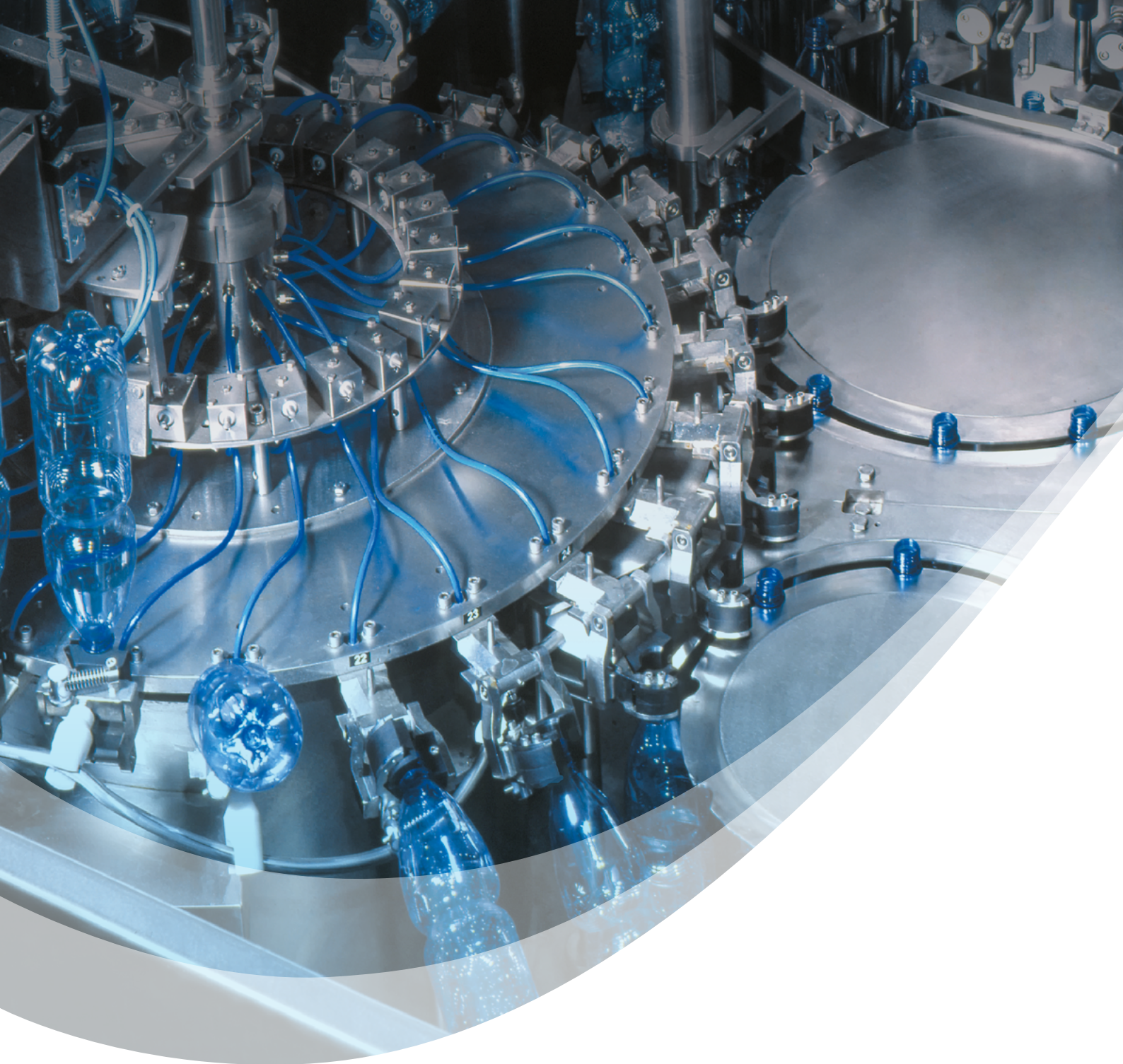




SEALING SOLUTIONS FOR APPLICATIONS IN THE BEVERAGE INDUSTRY

FREUDENBERG
SEALING TECHNOLOGIES

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TABLE OF CONTENTS

1	CHALLENGES FOR SEALS IN THE BEVERAGE INDUSTRY	3
2	70 EPDM 291 – HIGH-PERFORMANCE MATERIAL FOR CIP/SIP PROCESSES	6
3	FLUOROPRENE® XP – NO CHANCE FOR AROMA TRANSFER IN BOTTLING PLANTS	8
4	EVERYTHING FROM A SINGLE SOURCE – YOUR BENEFITS	12
5	OUR SEALING SOLUTIONS FOR APPLICATIONS IN THE BEVERAGE INDUSTRY	13
	Filling systems	
	Pumps (example of an air operated double diaphragm pump)	
	Process valves (example of a double-seat valve)	
	Mixers, containers and tanks	
	Stretch blow molding machines	
	Sensors	
	Heat exchangers	
	Pipe connection systems	
	Separators	
	Decanters	
	Homogenizers	
	Cleaning systems and CIP/SIP systems	
	Dispensing equipment	

CHALLENGES FOR SEALS IN THE BEVERAGE INDUSTRY



Due to the many different applications, there are a variety of challenges for seals in the beverage industry that need to be overcome. Preventing aroma transfer plays an important role, for example, especially in the bottling of beverages. In addition, seals must conform to the relevant industry-specific standards and withstand strong temperature fluctuations and aggressive media. Applications in the beverage industry

therefore require sealing solutions that reliably prevent contamination and can come into contact with the product without having to worry. The following graphic provides an overview of the various challenges and special features that have to be overcome by system manufacturers in the beverage industry.

CHALLENGES FOR SEALS IN THE BEVERAGE INDUSTRY

CIP/SIP RESISTANCE

In applications in the beverage industry, the sealing materials must withstand aggressive media such as CIP/SIP cleaning agents. During sterilization with hot steam, which is often performed in addition to liquid cleaning, temperatures of up to 145°C (293°F) are occasionally reached. Seals should also be able to withstand this without losing any of their functionality.

HIGH PRESSURES

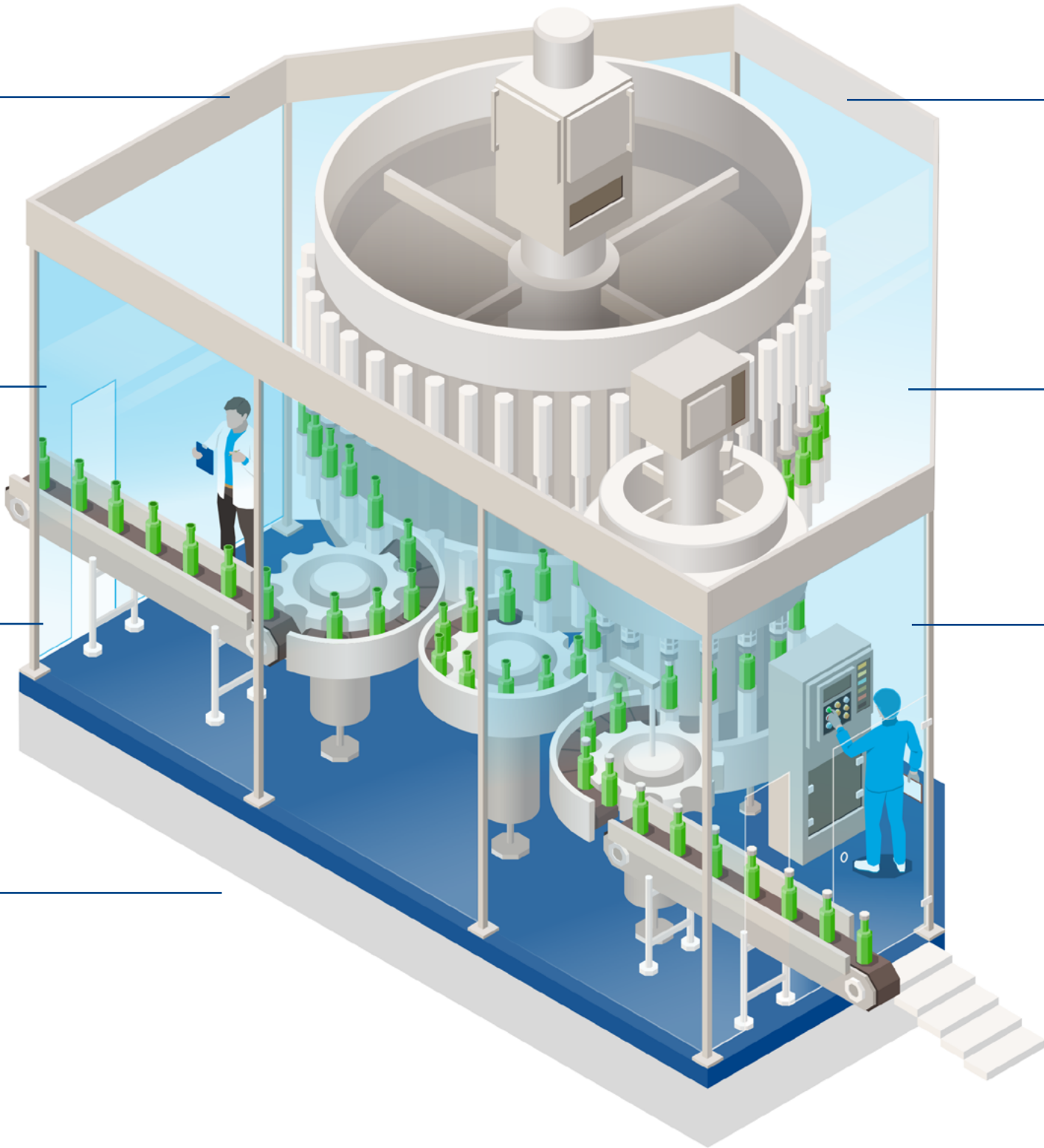
During the filling of beverages, for example, high pressures can arise in valves to which the seals are exposed and have to withstand.

AGGRESSIVE MEDIA

Seals for breweries, for instance, must be able to withstand not only aggressive cleaning media concentrates (CIP/SIP module) and high steam temperatures (steam systems), but also other stresses such as salt formation (beer stone) and thus an abrasive element in the medium. In the filling of soft drinks, on the other hand, aroma substances can negatively affect the seal material.

HYGIENIC DESIGN

The high cleanliness and hygiene standards require good cleanability of the equipment. Therefore, seals should be constructed according to Hygienic Design so that dead spaces are prevented and contamination of the product can be ruled out.



AROMA TRANSFER

Especially when filling soft drinks, preventing aroma transfer from one beverage to another poses the biggest challenge. However, seals made of special high-performance materials can prevent this.

ABRASIVE MEDIA

Beer wort, sugar and other abrasive media take a heavy toll on seals in the beverage industry. The materials for these applications must therefore be extremely abrasion-resistant.

CONFORMITIES AND APPROVALS

Seals are often in direct contact with the process medium. Therefore, materials for the food and beverage industry must have all of the important certifications and comply with relevant standards, such as FDA , EG (Reg.) 1935/2004, 2023/2006, 3-A® Sanitary Standards, NSF 51 as well as the standards GB 4806 and GB 9685 applicable for the Chinese market.

70 EPDM 291 – HIGH-PERFORMANCE MATERIAL FOR CIP/SIP PROCESSES

Cleaning cycles by using the CIP/SIP process (Cleaning In Place/Sterilization In Place) has become indispensable in the food and beverage industry. Cleaning and sterilizing equipment in a closed cleaning agent circuit without having to first disassemble it requires less work and thus saves time and money. Due to the high cleanliness requirements, the cleaning process needs to be reliable. This requires components whose geometry does not allow microorganisms to settle in dead spaces and which are at the same time capable of withstanding cleaning and sterilization in the CIP/SIP process. Not every seal can be used for this.

CIP includes fully automatic cleaning without dismantling the equipment. Lyes and acids are used to remove organic and inorganic contaminants. SIP refers to cold sterilization with peroxide-based cleaners, active chlorine-based cleaners or hot steam. Seals used in systems with CIP/SIP processes must reliably withstand these conditions without being damaged. Here, the cleaning media and the cleaning process itself are often more critical than the product media. There are various challenges to be overcome in CIP/SIP processes. For example, the sometimes aggressive process and cleaning media can chemically attack the sealing materials, leading to a loss of mechanical properties. In addition, the sometimes high temperatures during cleaning can lead to accelerated aging of the seals.

Chemical resistance and resistance to product media combined in one seal

Based on the above, it is clear that special attention must be paid to CIP/SIP processes. Sterilization with hot steam, which can take place at temperatures of up to 145°C (293°F), is one concrete example. The seals must also be able to withstand this without losing any of their function. In addition, the seals must also withstand food products. Examples include beer wort, fatty chocolate, dairy products and various beverages. Not all seal materials can perform this balancing act because the products have a completely different effect on the seals than the cleaning agents.

CIP/SIP processes are controlled by special CIP/SIP modules that are connected to the actual process equipment. The cleaning media in the CIP/SIP modules are partly available as pre-prepared concentrates. Therefore, the focus for the sealing materials in this area is on chemical and less on thermal resistance. Together with the diluted cleaning agents and the products, this results in a high range of challenges that the sealing materials must be able to overcome.

70 EPDM 291 – outstanding properties in critical application media

With its outstanding properties in critical media, the material 70 EPDM 291 from Freudenberg Sealing Technologies is the first choice for a wide range of O-ring, molded part and diaphragm applications in the food and beverage industry. This is also shown by the results of the benchmark study in which 70 EPDM 291 was compared with two EPDM compounds from competitors in terms of their resistance in CIP/SIP media (Figure 1).

Here it became clear that 70 EPDM 291 shows very good resistance to the CIP/SIP media and the associated demanding conditions (e.g. in steam up to 180°C/356°F). In the study, the result values for hardness and volume change were always below the critical mark of ±10 and ±10%, respectively, and with regard to tensile strength and elongation at break, they were below the critical value of ±30%. The EPDM materials from competitors exceeded these critical marks at various points. Due to the universal resistance of 70 EPDM 291 to CIP/SIP processes, the risk of seal failures is minimized.

70 EPDM 291 – approvals & certifications

Furthermore, 70 EPDM 291 meets many national and international legal and conformity requirements, such as:

- EG (Reg.) 1935/2004
- FDA
- NSF 51
- 3-A® Sanitary Standards
- ADI free
- (additionally USP Class VI for the pharmaceutical industry)

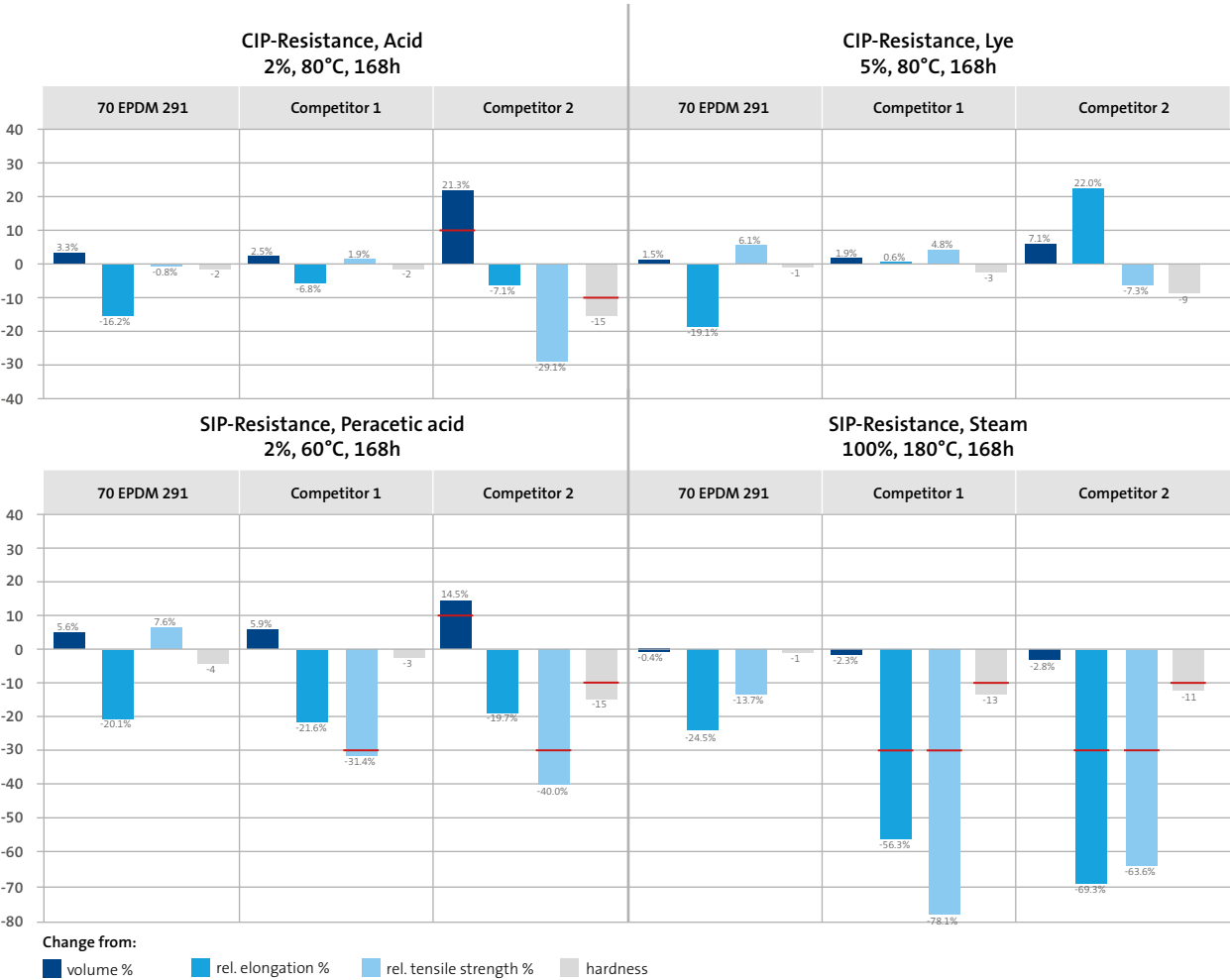


Fig. 1: CIP/SIP resistance tests – Benchmark 70 EPDM 291 compared to two materials from competitors.

CONCLUSION

Compared to the two materials from competitors, the proven 70 EPDM 291 from Freudenberg Sealing Technologies performed well thanks to its very good resistance in CIP/SIP media. It also exhibits very good resistance in water and steam up to 180°C (356°F) as well as balanced mechanical characteristics, long service life, very high abrasion resistance and excellent elastic behavior. For the beverage industry, black EPDM is thus virtually predestined due to its resistance in aqueous media of breweries and mineral springs, for example. Only in contact with very fatty products and special flavors and citrus juices can Fluoroprene® XP be better suited (see next section).



FLUOROPRENE® XP – NO CHANCE FOR AROMA TRANSFER IN BOTTLING SYSTEMS

Beverage bottlers know only too well the problem of aroma transfer from one batch to the next. The result is a loss of quality. It can even happen that beverages become unsellable if they are adversely affected in terms of their taste by flavorings from a previously bottled beverage. Bottling each flavored beverage on its own line is also not the solution from an economic point of view. So what is the answer?

The materials experts at Freudenberg Sealing Technologies have risen to the challenge. In the beverage industry, the choice of the right sealing material is crucial in order to rule out the possibility of seals used in the filling line causing aroma transfer. Freudenberg Sealing Technologies developed the material Fluoroprene® XP, which is perfectly matched to the requirements of the food and beverage industry. Test series also show that the material is ideal for use in filling systems that process beverages with intense aromas or flavors.

A wide range of flavors are used in the food and beverage industry, in the production of soft drinks, for example. Studies show that aroma substances – here a distinction is made between aldehydes, terpenes, esters and ketones – attack elastomeric materials very differently due to their different chemical compositions. During aroma transfer, i.e. the process in which aroma substances initially migrate into the elastomer and are released again during a product change, the individual components of the aroma substance mixture accumulate in the elastomer, which can lead to swelling. Or they can lead to a structural change, as the crosslinking bridges of the elastomer matrix are attacked, which in turn can impair the sealing function. All of this is undesirable. The right combination of sealing material and flavoring is therefore important.

Due to the large number of flavors, it is difficult to make a blanket recommendation for a sealing material. It therefore often requires an individual examination of the influence of the flavors used on the sealing material. However, Freudenberg Sealing Technologies can answer some basic questions about the resistance of elastomer materials on the basis of decades of experience. Here, the material Fluoroprene® XP – as is shown in the following – often proves to be a good solution.

Test series show the difference

Various studies show that sealing materials absorb aromas to significantly different degrees. This is a crucial point because, simply put, a substance that cannot penetrate in the first place cannot escape later on either. EPDM and FKM are among the most widely used elastomeric materials in the food industry. But please be careful because they are not suitable across the board for contact with flavors.

The advantages of FKM lie in its excellent resistance to aliphatic and aromatic hydrocarbons as well as oils, fats and citrus aromas. The non-polar EPDM, on the other hand, is not at all compatible with these media, as it swells strongly. FKM, on the other hand, has only limited resistance to many cleaning media and is often not well suited for the aldehydes, ketones and carboxylic acids found in flavors. This is where the high-performance material Fluoroprene® XP from Freudenberg Sealing Technologies comes into play. Anyone who does not want to resort to expensive perfluoroelastomers (FFKM), which do not meet the requirements of EG (Reg.) 1935/2004 anyway, should consider using this material. In addition, Fluoroprene® XP exhibits significantly better chemical resistance than FKM.

Figure 2 shows a resistance test in pure orange oil, i.e. how sealing materials behave toward terpene D-limonene, the main component of the orange aroma. Here it can be clearly seen that EPDM as well as silicone (VMQ) increase in volume by more than 100 percent after the first 24 hours. The swelling behavior of HNBR also exceeds the tolerable level. It is also clear that fluororubbers such as FKM and Fluoroprene® XP, on the other hand, prove to be very resistant and are ideally suited for use in terpenes.

Fluoroprene® XP also exhibits by far the lowest volume swelling in ester, aldehyde and ketone-based flavor concentrates such as “Fantasy Fruit Flavor,” “Raspberry Flavor” and “Peach Flavor,” as can be seen in Figure 3. In contrast, the chemical resistance of FKM is not sufficient here, as it swells. Here it becomes clear that Fluoroprene® XP is best suited for contact with different flavor compounds due to its low swelling values.

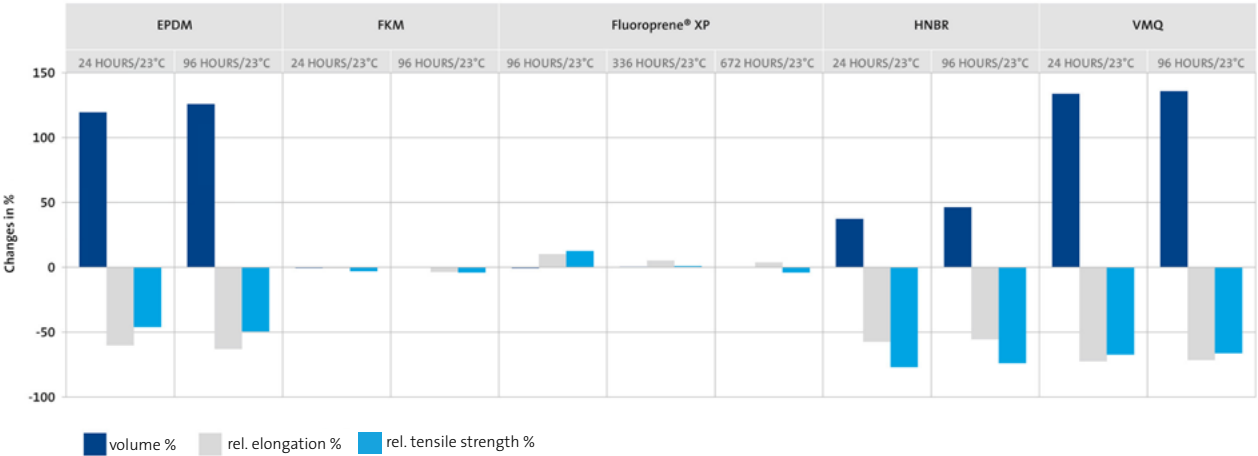


Fig. 2: Exposure results of EPDM, FKM, Fluoroprene® XP, HNBR and VMQ in orange oil

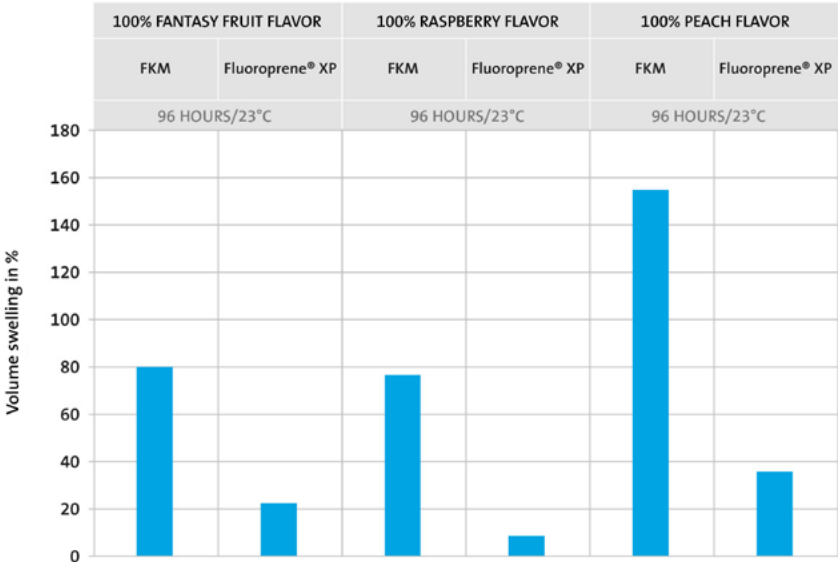


Fig. 3: Volume swelling of FKM and Fluoroprene® XP in different aroma concentrates

Another test looks into the migration processes into and out of the elastomer matrix. For this purpose, EPDM and Fluoroprene® XP were stored in an aroma mixture with known ingredients (four esters and three ketones) for 24 hours, rinsed off and analyzed by gas chromatography and coupled mass spectrometry (GC/MS) (Figure 4). The values determined for EPDM immediately after pre-cleaning were assumed to be 100% for better comparison. Elastomer samples were then washed with hot water at 80°C (176°F) for 15 minutes and subjected to GC/MS analysis once again. Here, for example, ester could not be detected at all after the washing process. Ketones migrated into the matrix of Fluoroprene® XP, but could be quickly washed out. By washing it with water, 50% of the absorbed ketones could be dissolved out of Fluoroprene® XP again. It is also clear here that EPDM absorbs all aromatic substances and releases them again in very different ways. These differences in migration kinetics can be observed for both esters and ketones. Thus, it could be shown that Fluoroprene® XP is the best choice for processes in which several flavored beverages are filled on one line, due to its low absorption capacity for flavors.

Fluoroprene® XP – the universal material

The blue material Fluoroprene® XP is considered a universal material for the food, beverage and pharmaceutical industries. Its numerous advantages are quite convincing, as it exhibits very good resistance to steam sterilization,

CIP/SIP media, aqueous systems, high grease concentrations, as well as to most aromatic substances and acids (Figure 5). The temperature application range of Fluoroprene® XP for static use is between -15°C and +200°C (+5°F and +392°F), depending on the material design. Numerous storage tests over 168 hours prove that the material can be used without any problems in different cleaners at the maximum temperature, concentration and cleaning duration recommended by the manufacturer.

Fluoroprene® XP – approvals & certifications

As a basic prerequisite for suitability for the food and beverage industry, Fluoroprene® XP has many nationally and internationally relevant approvals and compliances, such as:

- EG (Reg.) 1935/2004
- FDA
- NSF 51
- 3-A® Sanitary Standards
- ADI free
- BNIC, applies for 75 Fluoroprene® XP 40 and 41
- (additionally USP Class VI for the pharmaceutical industry)

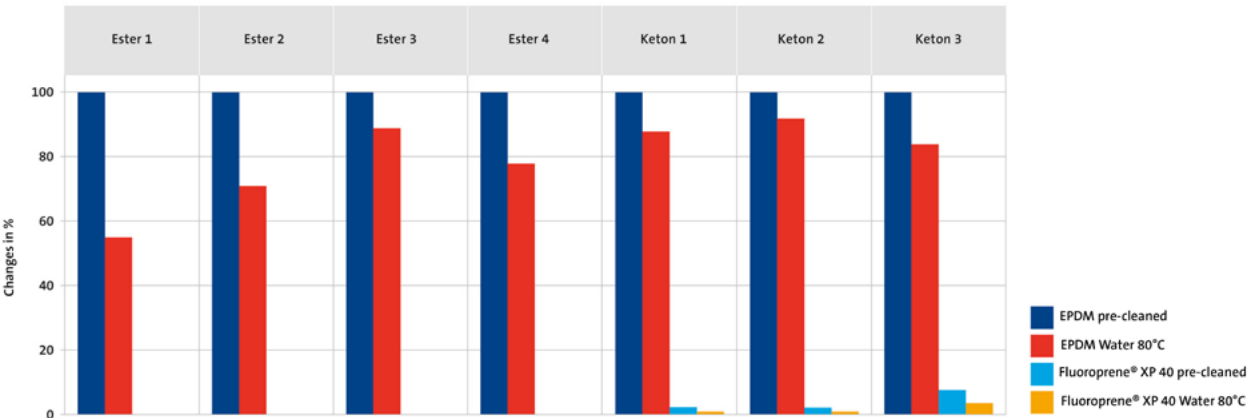


Fig. 4: Aroma migration in EPDM and Fluoroprene® XP

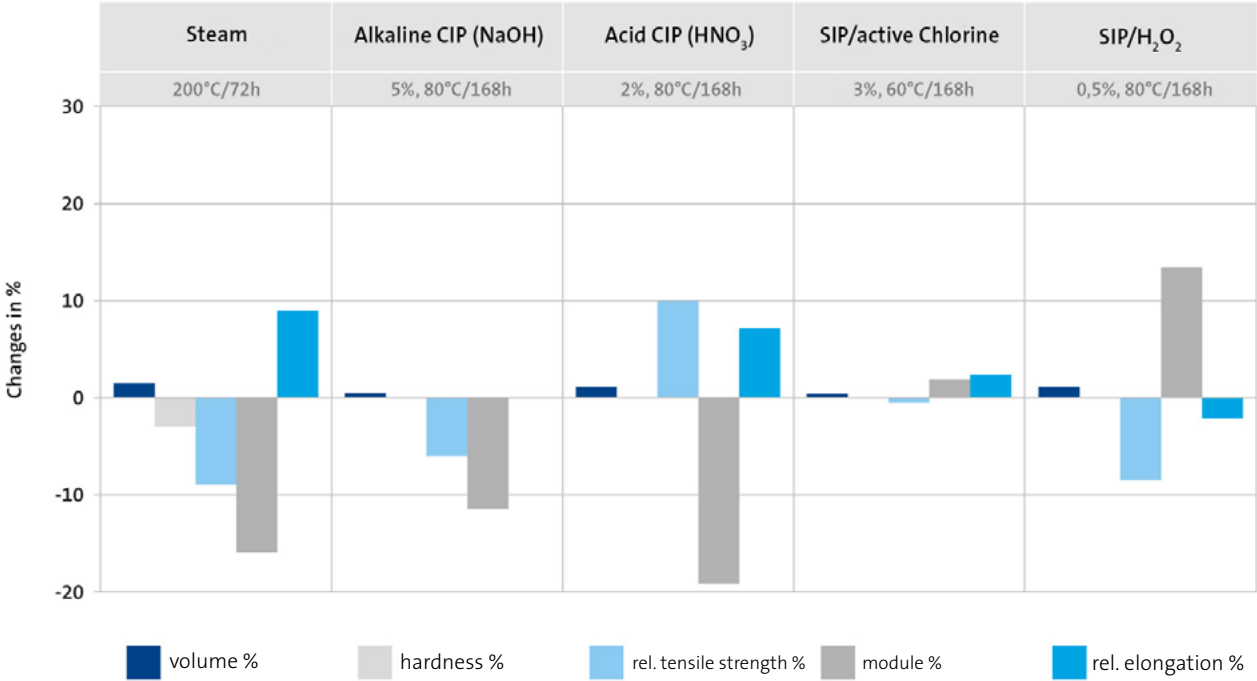


Fig. 5: Fluoroprene® XP in cleaning media

CONCLUSION

Fluoroprene® XP minimizes unwanted aromatic transfer due to its chemical nature. Its absorption and release capacity is lower than that of EPDM materials by a factor of 80 in some cases. The latter absorb aromas and possibly release them to other products. This proves to be highly problematic, especially in the case of subsequent filling of tasteless products. For facilities in which several types of beverages are bottled, seals made of Fluoroprene® XP material are generally recommended. Many operators confirm that, thanks to this material, aroma transfer is reduced for most aromatic substances. In short, Fluoroprene® XP is a very good solution for minimizing aroma transfer in beverage filling lines.



EVERYTHING FROM A SINGLE SOURCE – YOUR BENEFITS



MATERIAL EXPERTISE

- Extensive expertise in the area of premium quality elastomer and plastic materials
- In-house development and production of high-performance materials with all relevant approvals
- Own accredited test laboratory for analyses



DESIGN EXPERTISE

- Development and calculation based on the Finite Element Method (FEM)
- In-house test bench for perfect matching of valve seals to the respective CIP/SIP process
- Customer-specific solutions according to Hygienic Design



OUR KNOW-HOW
for sealing solutions
in the beverage industry

MANUFACTURING EXPERTISE

- Own production sites worldwide
- Production of prototypes without tooling costs. Short-term requirements can be met and small series can be made available from original materials by the Freudenberg Xpress® Service



CONSULTING AND SERVICE EXPERTISE

- Expertise on the selection of materials and the hygienic design of sealing solutions
- Application consulting through countless tests (CIP/SIP database) and cooperation with cleaning agent manufacturers
- Global stocking program allows for fast delivery
- Laser marking
- Individual packaging concepts (individual and kit packaging, customer-specific packaging bags)



OUR SEALING SOLUTIONS FOR APPLICATIONS IN THE BEVERAGE INDUSTRY



There are many different applications in the beverage industry, all of which place individual requirements on seals. Freudenberg Sealing Technologies offers appropriate and innovative sealing solutions for your individual process. From customer-specific molded parts to standardized

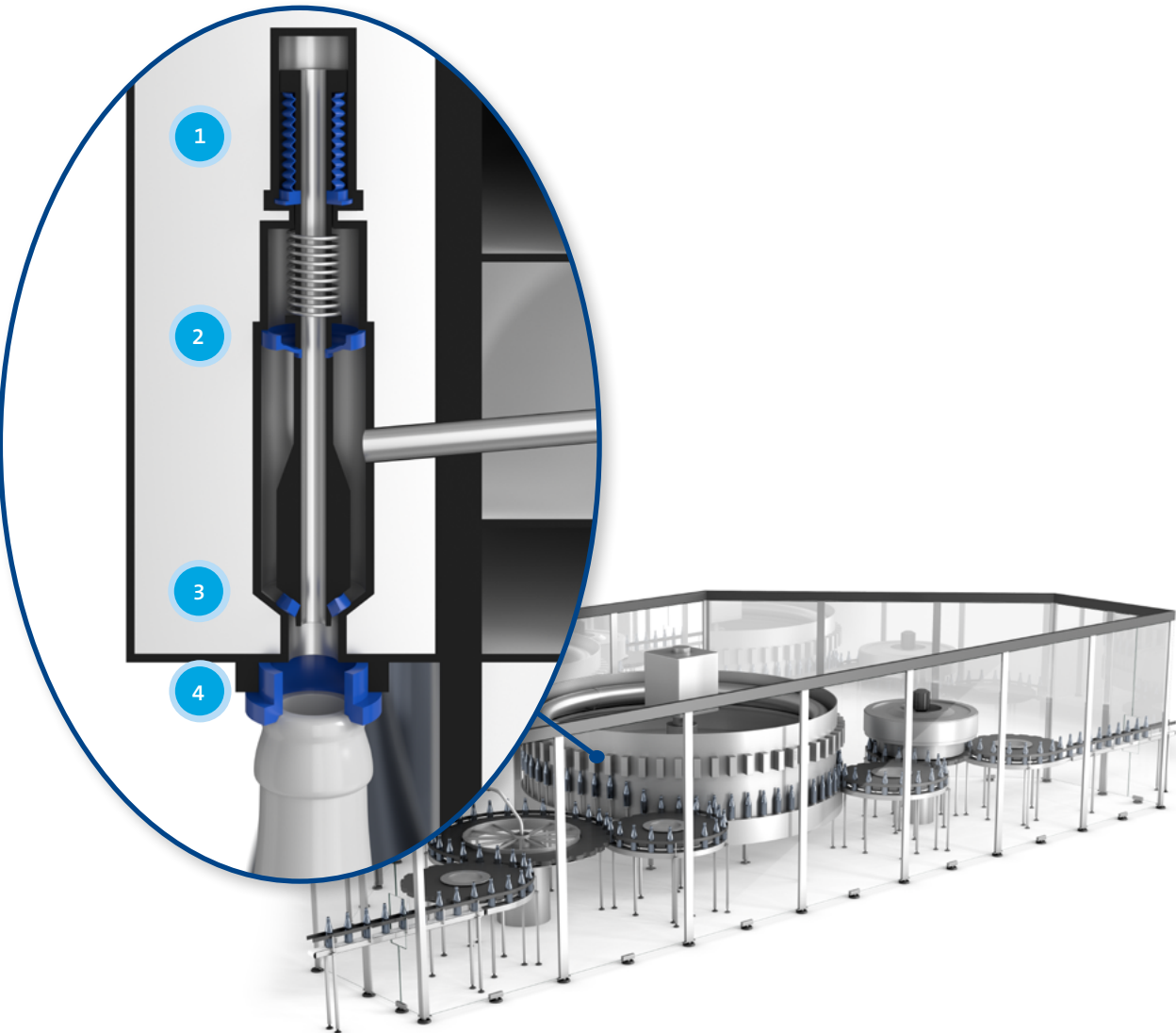
clamp seals – the portfolio includes all sealing products. Valves, mixers, pumps, including their connecting lines, and many other applications are thus hygienically and safely sealed. The following pages provide an overview of our sealing portfolio for applications in the beverage industry.

FILLING SYSTEMS

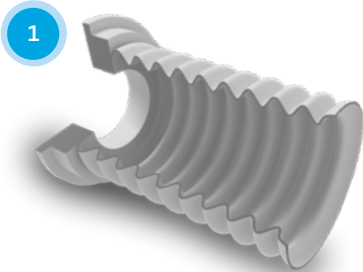
The requirements that filling systems in the beverage industry must meet are very special and varied. They range from strict hygiene conditions to high precision requirements. Freudenberg Sealing Technologies offers, among other products, the following special sealing solutions for filling systems made of premium materials:

- Bellows
- Diaphragms
- Clamp seals
- U-cup rings
- Wipers
- Piston seals
- O-rings
- Radial shaft seals (e.g. Simmerring®, Radimatic® HTS II)
- Customer-specific parts

SEALING SOLUTIONS FOR FILLING VALVES



TAKE A CLOSER LOOK AT THE SEALING SOLUTIONS IN A FILLING SYSTEM IN THIS 3D ANIMATION!



BELLOWS

Bellows protect the mechanical elements inside the filling unit from the surrounding media. They are matched to the movement, dimension, media and conformity requirements in terms of material and design. Appropriate designs of the folds also ensure good cleanability. To prevent premature failure of the bellows, bending fatigue strength must also be taken into account when selecting the material and excessive frequency and movement must be prevented. Freudenberg Sealing Technologies offers bellows for this purpose that are made of the right elastomers and PTFE materials.



DIAPHRAGMS

The diaphragms installed in filling units are used for sealing inside the filling valve. Since they come into direct contact with the product medium, they must be food compliant, i.e. they must meet the requirements of industry-specific legal regulations. Diaphragms from Freudenberg Sealing Technologies can be developed to accommodate your individual operating conditions. They meet the hygiene and legal requirements for seals in contact with foodstuffs and offer a long service life.



CUSTOMER-SPECIFIC PRODUCTS

VALVE SEAT SEALS

Valve seat seals provide a dead space and migration-free seal for process media within the filling valve. Since they come into direct contact with the bottled beverage, they must be made of high-purity materials that also meet legal requirements such as FDA and EG (Reg.) 1935/2004. Freudenberg Sealing Technologies offers specially developed material variants for these conditions, such as 75 Fluoroprene® XP 41. The material 75 EPDM 386 even additionally meets the Chinese directives GB 9685 and GB 4806.



BOTTLE FILLING SEALS

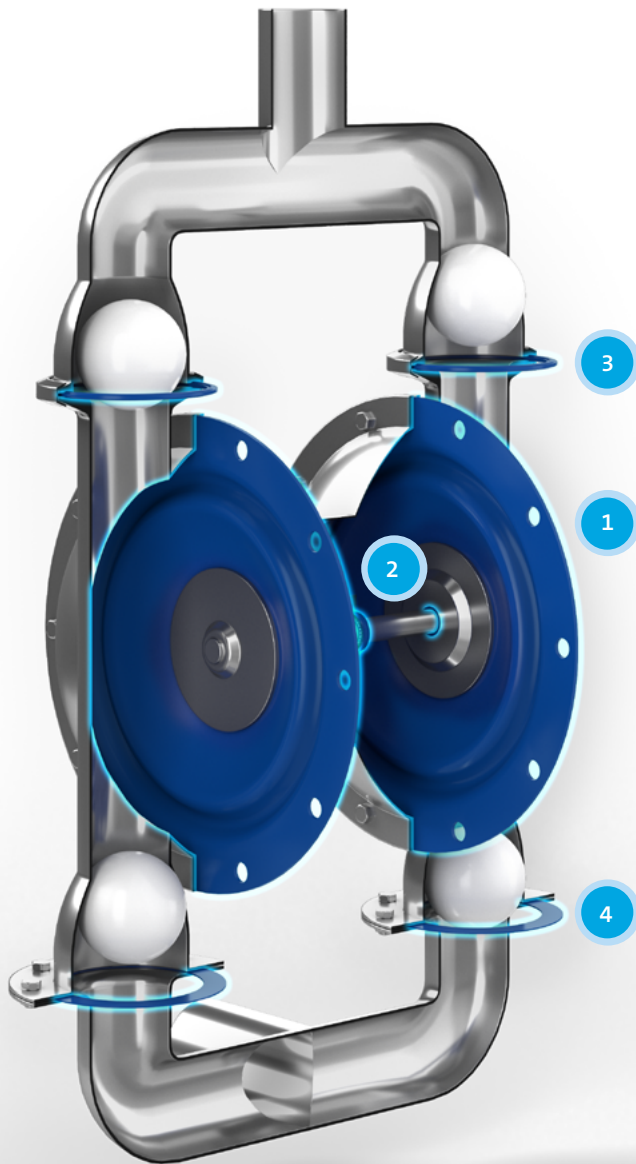
The bottle filling seal is used to seal the neck of the bottle during filling. Elastomer materials such as EPDM, Fluoroprene® XP or HNBR are used here. In some cases, the bottle filling seal can also be made of polyurethane. Bottle filling seals from Freudenberg Sealing Technologies are characterized by a long service life, i.e. low wear.

PUMPS

The seals inside pumps can come into direct contact with the medium. Due to the wide variety of media, many different types are available, such as diaphragm, centrifugal or piston pumps. Freudenberg Sealing Technologies offers a broad portfolio of sealing solutions for use in pumps, including:

- Diaphragms
- O-rings and U-cup rings
- Clamp seals
- Flat gaskets
- V-seal set packings
- Radial shaft seals

SEALING SOLUTIONS FOR AIR OPERATED DOUBLE DIAPHRAGM PUMPS



TAKE A CLOSER LOOK AT THE SEALING SOLUTIONS INSIDE AN AIR OPERATED DOUBLE DIAPHRAGM PUMP IN THIS 3D ANIMATION!

1



DIAPHRAGMS

The materials used in the beverage industry must comply with the relevant legal regulations, such as FDA or EG (Reg.) 1935/2004, and withstand various process and cleaning media. Due to a high number of pumping cycles, the diaphragms used must also be friction-resistant, have good mechanical properties and a long service life. Freudenberg Sealing Technologies offers many solutions made of PTFE or elastomeric premium materials such as 70 EPDM 291, 70 EPDM 217937, 60 EPDM 217952, Fluoroprene® XP or 75 HNBR 181070. To meet your requirements in the best possible way, diaphragms can also be custom-designed and manufactured to suit your individual application conditions.

2



O-RINGS AND U-CUP RINGS

Both O-rings and U-cup rings are used to seal the area of the pump where the diaphragm itself is located. As this moves back and forth, it is important that the media cannot escape from the process. Freudenberg Sealing Technologies offers the right solution for every requirement – from moderate to very demanding operating conditions, including various product and cleaning media. For O-rings, for example, the materials portfolio includes high-performance FFKM Simriz®.

3



CLAMP SEALS

Clamp seals are used to seal connections between different components of the diaphragm pump. Clamp seals according to DIN 32676 are the preferred variant, especially in the beverage industry. Freudenberg Sealing Technologies offers a range of high-performance materials for clamp seals, such as 70 EPDM 291, 75 Fluoroprene® XP 41 or 70 VMQ 117055.

4



FLAT GASKETS

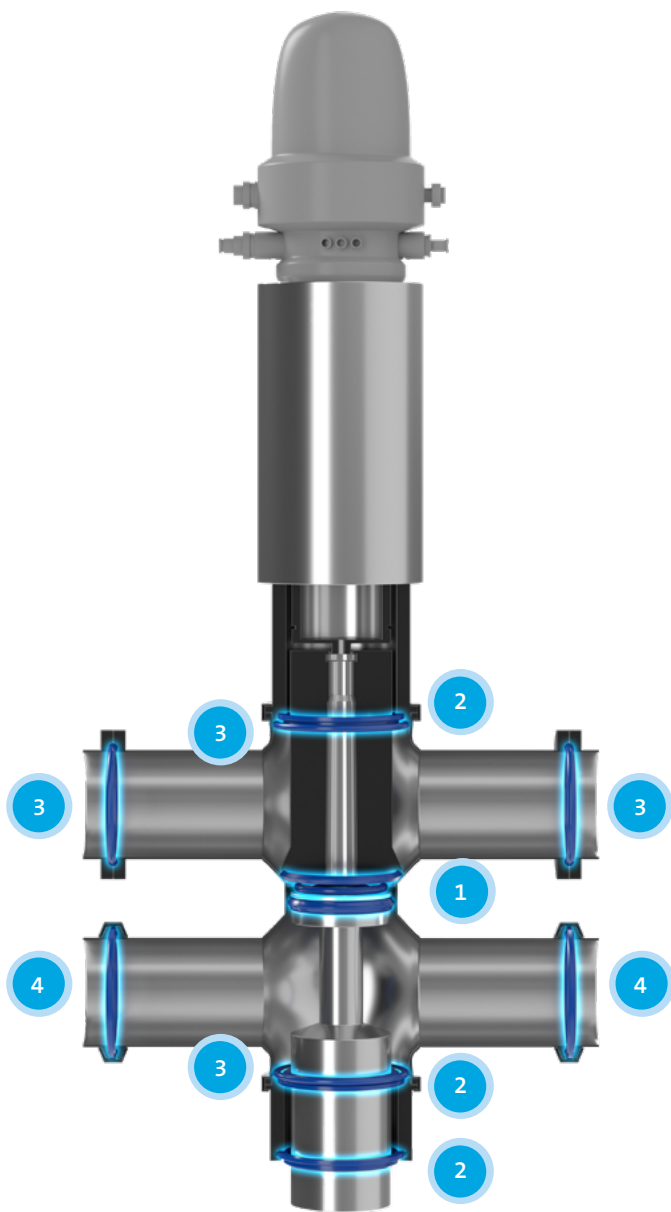
As an alternative to clamp seals, flat gaskets are also used to seal the connections between different components of the diaphragm pump. The Freudenberg Sealing Technologies portfolio includes flat gaskets made of various materials for applications in the process industry.

PROCESS VALVES

For hygienically demanding areas in valves, Freudenberg Sealing Technologies offers sealing solutions designed according to Hygienic Design Standards. They ensure maximum safety for all types of valves, such as single-seat and double-seat valves, diaphragm and butterfly valves:

- Customer-specific products (e.g. shaft seals, radial seals, axial seals, butterfly valve seals, rod seals, diaphragms)
- O-rings
- Clamp seals
- Piston seals

SEALING SOLUTIONS FOR DOUBLE-SEAT VALVES



TAKE A CLOSER LOOK AT THE SEALING SOLUTIONS INSIDE A DOUBLE-SEAT VALVE IN THIS 3D ANIMATION!

1



CUSTOMER-SPECIFIC PRODUCTS

RADIAL SEALS AND AXIAL SEALS

In combination with axial seals, radial seals provide optimal sealing of process media without dead space or back migration. Freudenberg Sealing Technologies has developed a patented radial seal in accordance with Hygienic Design for the special requirements of the beverage industry, which is also wear-resistant and low-friction. Furthermore, it has successfully passed the demanding tests of the EHEDG certification.

2



SHAFT SEALS

The designs of our shaft seals are specially adapted to the respective customer-specific operating conditions and tasks in the sealing system. In doing so, they meet the high expectations in terms of Hygienic Design, trouble-free assembly, durability, low friction and temperature resistance. Our durable premium materials are also individually selected to suit the respective application. For particularly demanding applications, bonding a PTFE film to the elastomer ensures greater safety and higher chemical resistance.

3



O-RINGS

Freudenberg Sealing Technologies offers O-rings for aseptic flange connections according to DIN 11864 especially for the requirements of the process industry. The O-rings ideally combine the advantages of easy assembly with the absence of dead space at the sealing point and close flush with the inner diameter of the pipe. It is particularly important here that the material of the seal be matched to the process media. Freudenberg Sealing Technologies also offers O-rings for housing sealing in premium materials. These are available in many dimensions and can be supplied directly from stock.

4



CLAMP SEALS

Freudenberg Sealing Technologies offers a range of high-performance materials for clamp seals, such as 70 EPDM 291, 75 Fluoroprene® XP 41 or 70 VMQ 117055, for the special requirements of the beverage industry.

MIXERS, CONTAINERS AND TANKS

Mixers require dynamic seals suited for contact with food and process media. Containers and tanks contain many different products, which often have a tank bottom valve. Freudenberg Sealing Technologies offers you the following sealing solutions for this:

- Radial shaft seals
- Guide rings
- Flat gaskets
- O-rings
- Clamp seals
- Hygienic Usit® rings
- Customer-specific products (e.g. in the exhaust valve: shaft seals, radial and axial seals, butterfly and rod seals, diaphragms)

SEALING SOLUTIONS FOR MIXERS



TAKE A CLOSER LOOK AT THE SEALING SOLUTIONS INSIDE A MIXER IN THIS 3D ANIMATION!

1



RADIAL SHAFT SEALS
Freudenberg offers various radial shaft seals for sealing rotating shafts. The Radiamatic® HTS II is a special development made of PTFE and can be used in a wide range of applications in the beverage industry. Industry-specific developments with regard to media resistance as well as innovative sealing lip designs for freedom from dead space in accordance with Hygienic Design and material variations make Freudenberg radial shaft seals the ideal choice.

2



GUIDE RINGS
Guide rings from Freudenberg Sealing Technologies are made of the premium material PTFE Y005, exhibit a uniquely low extrusion tendency and thus guarantee a long service life. Guide rings are used, among other purposes, for pistons to compensate for lateral forces in machines.

3



FLAT GASKETS
Freudenberg Sealing Technologies offers highly media-resistant flat gasket types for the special requirements of the beverage industry. Thanks to their industry-specific approvals, the die-cut or plotted flat gaskets made of expanded materials cover all applications in the beverage industry.

4



COVER SEALS AND PROFILE SEALS
Freudenberg Sealing Technologies offers seals in various geometries and materials for easy sealing of doors and container covers. For example, FEP-encapsulated or elastomer O-rings that have all the relevant approvals and can therefore safely come into contact with the process medium. Profiles made of high-performance materials such as EPDM, NBR, FKM, VMQ and, most recently, Fluoroprene® XP are also available. These are not only resistant to a wide range of process and cleaning media, but also withstand high pressures and temperature fluctuations and offer a long service life.

STRETCH BLOW MOLDING MACHINES



The demands placed on the sealing material are not only very high for the filling process itself. Aseptic solutions are also required for stretch blow molding machines that are used to produce PET bottles for fruit juices, water, and soft drinks, for example. The PET bottle blanks (preforms) are cleaned, heated, stretched, and thermoformed. During this process, the blanks are subjected to constantly high temperatures of 95°C – 120°C (203°F – 248°F), which the seal must be able to withstand. In addition, the high production speed that can be achieved requires seals made of adapted and resistant materials. Freudenberg Sealing Technologies offers sealing solutions for this purpose, such as **O-rings**, **clamp seals**, **high-pressure U-cup rings made of PTFE**, or **customer-specific molded parts** made of materials with very good mechanical and dynamic properties.

SENSORS



Sensors are often used to monitor individual processes in reactors or mixing plants. They detect media conditions, convert what are usually physical variables into electrical signals and are the basis for controllable processes. For example, temperatures, pressures, weights, fill levels, flow rates, pH values or even viscosities are recorded. The sealing material depends on the task the seal should perform. If the seals are installed in the vicinity of the media, they must comply with certain regulations for use in the food and beverage industry. These include FDA and EG (Reg.) 1935/2004, for example, and the seal material must also have high chemical and thermal resistance. High temperatures can easily occur and it is not uncommon for aggressive cleaning agents to be used. The mechanical stress on seals in sensor applications, on the other hand, is low. However, good elasticity and a long service life of the seal are important. Freudenberg Sealing Technologies offers a broad portfolio of elastomers for sensors. Materials such as 70 EPDM 291 and 75 Fluoroprene® XP 41 are suited for **O-rings and customized molded parts** in sensors. Furthermore, we offer **flat gaskets** made of various materials.

HEAT EXCHANGERS



In the food and beverage industry, not just water is passed through heat exchangers, but also milk or cleaning agents. To ensure safe processes, all sealing solutions must be resistant to these types of media. The experts at Freudenberg Sealing Technologies will be happy to advise you on **O-rings** and **customer-specific sealing solutions** as well as the selection of the appropriate sealing material.

PIPE CONNECTION SYSTEMS



Pipe connection systems form an important part of all systems used in the beverage industry. Flanges with static seals are mainly used as connectors. For this purpose, Freudenberg Sealing Technologies offers high-quality sealing solutions made of food-grade materials that ensure optimal process reliability. The portfolio ranges from **clamp seals**, available in five different high-performance materials, to **dairy couplings, flat gaskets, O-rings conforming to DIN EN 11864** for aseptic flanges, and **Hygienic Usit® rings**. All sealing materials, such as EPDM and Fluoroprene® XP, are resistant to chemicals, cleaning agents, high temperatures and CIP/SIP processes. Thus, a maximum service life is achieved.

SEPARATORS



A separator is a vertically arranged centrifuge. It is used for separating and clarifying liquids, which are separated by centrifugal force. Separation technologies are of crucial importance, especially in the beverage, brewing, and dairy industries. Centrifugal separation is used, for example, to separate milk into skim milk and cream or to separate particles from juices. Separators play a crucial role in the brewing industry, especially for beer clarification. Seals in separators must be able to withstand high dynamic loads due to the centrifugal force. We offer special sealing solutions, such as **square rings, PA 12 rings, O-rings and diaphragms**, as well as **PTFE radial shaft seals, such as the Simmerring® HTS II 9539 VL and the Simmerring® B2PT**, which can withstand aggressive media, high pressure loads and product media.

DECANTERS



Decanters are horizontally mounted centrifuges with a cylindrical-conical solid bowl into which the centrifugal material is fed via an inlet tube. In the bowl, the solid particles are then sedimented against the bowl wall by centrifugal force. The drum also contains a rotating screw conveyor that squeezes out the process medium (e.g. grapes or olives) by the compaction effect and transports the solids from the clarification zone via the drying zone to the outlet openings. Due to three axially intermeshing and rotating systems, the bearing seal in the decanter plays a key role. We also offer static and dynamic sealing solutions for this challenge, such as **Simmerrings®** for the decanter gears, **flat gaskets** for sealing the hood to the frame, and **O-rings** made of 70 EPDM 291 or 75 NBR 430.

HOMOGENIZERS



Homogenizers are an important component of many manufacturing processes in the food and beverage industry, as they can improve the quality of the final product. For example, they can prevent creaming and sedimentation in dairy products. They are also used to improve the viscosity, taste and texture of cream or fruit juice drinks, or to optimize the mouthfeel of soy drinks. The homogenization of products such as milk can also extend shelf life. To manage the special challenges in homogenizers, Freudenberg Sealing Technologies offers **rod seals, V-seal set packings, U-cup rings** made of polyurethane and EPDM as well as **O-rings** made of polyurethane, EPDM, NBR, Fluoroprene ® XP or FFKM, but also **guide rings and back-up rings** made of PTFE or PEEK as well as **bellows** made of NBR or CR.

CLEANING SYSTEMS AND CIP/SIP EQUIPMENT



Cleaning systems, such as CIP/SIP systems, ensure on the one hand that the product media do not come into contact with cleaning agents. In addition, they prevent contamination from previous product batches. This is achieved by using a complex distribution of the CIP/SIP media inside the machine through pipe systems, mostly via double-seat valves, also butterfly valves, pumps and sensors. Seals with very good resistance to high temperatures and CIP/SIP media must be used here. Freudenberg Sealing Technologies offers you **O-rings, molded parts and seat seals** made of EPDM and FKM, among other products.

DISPENSING EQUIPMENT



BEER TAPPING SYSTEMS

Beer dispensing starts at the so-called “keg.” This is a small barrel specially designed for industrial filling and aseptic storage of beverages. The keg is prepared for use by installing a keg coupler that allows gas under pressure to enter the keg and beer to flow out of the keg. The flow of beer is controlled by a downstream valve at the tapping point. Static and dynamic sealing is achieved by using standard seals and **O-rings** made of 70 EPDM 291. All seals must be hygienic and made of materials that comply with FDA and EG (Reg.) 1935/2004 and are certified according to NSF 51.



SODA FOUNTAINS

A soda fountain is a freestanding device that dispenses carbonated soft drinks called “fountain drinks.” Soda fountains can be found in grocery stores, restaurants, or at vending stands such as those found in movie theaters. The soda fountain mixes concentrated syrup, carbon dioxide, and chilled water to dispense a soft drink at a temperature of approx. 3°C (37.4°F). Static connections are sealed with **O-rings** or **customized seals**, which are typically made of 70 EPDM 291 or 75 Fluoroprene® XP 41 for highly concentrated syrups. Dynamic sealing is achieved with **custom-molded seals** made of 70 EPDM 291 or 70 FKM 727, which, unlike standard FKM, remains flexible at beverage dispensing temperatures. All seals in a soda fountain must be hygienic, i.e. free of dead space.



FROZEN BEVERAGE DISPENSERS

A frozen beverage dispenser is another version of a soda fountain, where the already mixed beverage flows into a container that is kept at a temperature of around -4°C (24.8°F). The product freezes on the side of the container and is scraped off to form small ice crystals. Static joints are sealed with **O-rings** made of 70 EPDM 291. Dynamic seals are made with specially molded seals composed of 70 EPDM 291 or 70 FKM 727. All seals must be hygienic and be made of a material that complies with FDA and EG (Reg.) 1935/2004 and are certified according to NSF 51.



BARGUNS

A bargun system works like a soda fountain, but is designed for use by a bartender in a bar. Much of the functionality (cooling, ratio control, etc.) is performed under the bar. From there, liquids flow through a flexible hose to the dispenser itself, where the bartender dispenses the desired product via thumb-operated buttons. The static connections are sealed with **O-rings** made of 70 EPDM 291. Dynamic sealing is performed either by O-rings made of 70 EPDM 291 or even **customized seals** made of 70 FKM 727. All seals must also be hygienic in this application and be made of materials that comply with FDA and EG (Reg.) 1935/2004 and are certified according to NSF 51.

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