



PROFILES AND INFLATABLE SEALS FOR THE PROCESS INDUSTRY

FREUDENBERG-NOK
SEALING TECHNOLOGIES

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INNOVATING TOGETHER

CHALLENGES FOR PROFILES AND INFLATABLE SEALS IN THE PROCESS INDUSTRY

The process industry encompasses a wide variety of applications and processes and therefore poses many different challenges on profiles and inflatable seals in food, beverage, pharmaceutical and chemical plants. Freudenberg Sealing Technologies has developed sealing solutions made

of high-performance materials that can withstand these demanding operating conditions, offer a long service life and can be tailored to each individual application. Especially for the process industry, these are also available in small quantities.

APPLICATION REQUIREMENTS



The multitude of applications with different operating conditions and in particular the reliable sealing of doors is one of the greatest challenges for the selection of the right seal itself. For example, there may be strong temperature fluctuations and extreme pressures that the selected profile or inflatable seal must be able to withstand. Especially in the sensitive processes of the pharmaceutical, food and beverage industries, very high purity standards apply to ensure a safe end product. Furthermore, a high level of reliability and safety must be guaranteed in chemical processes. In some cases, larger tolerances have to be bridged by designing the seal to suit the application.

AGGRESSIVE MEDIA



Not only the cleaning media of the frequently performed CIP/SIP processes, but also the product media can attack the sealing material. These can have a high fat content, contain abrasive fruit particles or aggressive flavors or be powdery or even toxic. Extremely dusty environments, in the chocolate or baking industries, for example, pose a special challenge. A buildup of the dusty or powdery media on the folds of the seal can severely restrict its functionality and must therefore absolutely be prevented.

LEGAL REGULATIONS



Various aspects play a role in meeting legal regulations in the process industry – from the hygienic design of the plant in accordance with the Hygienic Design Standards, to the ingredients of the seal, to the extraction values of the individual components. For example, seals in the food and beverage industry must meet the requirements of the U.S. FDA (Food and Drug Administration) and the European EU (Reg.) 1935/2004, among other specifications. In the pharmaceutical industry, approval according to USP Class VI is important.

EVERYTHING FROM A SINGLE SOURCE – YOUR BENEFITS



MATERIAL EXPERTISE

- In-depth material expertise in premium elastomers and silicones
- In-house development and production of high-performance materials with all relevant approvals such as FDA, USP Class VI and EU (Reg.) 1935/2004



DESIGN EXPERTISE

- In-house laboratory with a wide range of analysis methods for optimal adaptation to individual application conditions
- Development and calculation of virtual prototypes based on the Finite Element Method (FEM)
- Customized developments



OUR KNOW-HOW FOR PROFILES AND INFLATABLE SEALS IN THE PROCESS INDUSTRY

MANUFACTURING EXPERTISE

- Own and partner production sites worldwide
- Flexible production methods (e.g. injection molding, extrusion)
- Special vulcanization process for uniform quality



CONSULTING AND SERVICE EXPERTISE

- Many years of experience as part of the Freudenberg Group
- Application advice based on countless tests and our own analyses (e.g. CIP/SIP database, storage tests, thermal analyses)



DEVELOPMENT EXPERTISE

Possibilities for customized developments

In the area of inflatable seals mainly individual developments are required. Freudenberg Sealing Technologies offers a wide range of options for developing customized profiles specifically tailored to your requirements. For instance, in-house testing laboratories offer a wide range of analysis methods for both product development and failure analysis. These include thermal and dynamic-mechanical analyses as well as nuclear magnetic resonance, mass spectrometry, FEM designs and immersion tests in various media (e.g. chicken fat). This enables our experts to test the specially developed designs in terms of tolerances, friction, wear, pressure, temperature resistance, tensile strength and other important properties and thus optimize them for the customer's application. Test reports are supplied with the profile on request. Furthermore, the above test methods and processes support reverse engineering for the development process and facilitate in-house material development. Our experts are available to assist you throughout the development process and discuss with you the most important parameters, such as the size of the installation space, prevailing temperatures, potential wear hazards, frequency of use cycles, etc.

Wide range of production possibilities

With the help of in-house mold production, time and costs can be saved during product development. In addition, diverse and flexible production methods are available – from extrusion to various injection molding processes. Especially for critical very small dimensions, the possibility of injection molding is essential, as the seal could otherwise crack. Freudenberg Sealing Technologies has developed a special process to ensure consistently high quality, in which the profile joint is vulcanized with the same material from which the profile has already been manufactured. This brings considerable quality advantages compared to the otherwise often common adhesive bonding process.

CUSTOMIZED INFLATABLE PROFILE



EXTRUDED PROFILE



OUR PORTFOLIO OF MATERIALS

Benefit from Freudenberg Sealing Technologies' many years of experience in material development for demanding applications. The profiles are made of premium quality materials developed specifically for the process industry. 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. In order to meet the high purity requirements of the process

industry, the high-performance materials are compliant with industry-specific legal regulations, such as FDA, EU (Reg.) 1935/2004 or USP Class VI. The choice of the right material depends very much on the application and its operating conditions. Furthermore, the dimensions of the seal and the production method play a role. Our experts therefore support you with comprehensive material advice.

MATERIAL	PROPERTIES			POSSIBLE CONFORMITIES / APPROVALS									
				FOOD & BEVERAGE						PHARMA			
	AVAILABLE SHORE HARDNESSES	AVAILABLE COLORS	SPECIALTIES	EG (REG.) 1935/2004	FDA	NSF 51 / NSF 61	3-A [®] SANITARY STANDARDS	ADI FREE	ÖNORM	WRAS	UBA LEITLINIE	USP CLASS VI CH. 88 (IN VIVO)	USP CHAPTER 87 (IN VITRO)
EPDM	<ul style="list-style-type: none"> • 60 • 65 • 70 • 75 • 85 	<ul style="list-style-type: none"> • Black • White • Blue 		•	•	•	•	•	•	•	•	•	•
NBR	<ul style="list-style-type: none"> • 65 • 75 	<ul style="list-style-type: none"> • Black • Blue 		•	•		•	•					
FKM	<ul style="list-style-type: none"> • 60 • 70 • 75 	<ul style="list-style-type: none"> • Black • White • Blue 		•	•		•	•				•	
Fluoroprene [®] XP	<ul style="list-style-type: none"> • 75 • 85 	<ul style="list-style-type: none"> • Light blue 		•	•	•	•	•				•	•
VMQ	<ul style="list-style-type: none"> • 55 • 60 • 75 	<ul style="list-style-type: none"> • White • Red 	Variant with high tensile strength available	•	•		•	•					

OUR PRODUCT PORTFOLIO

Profile seals can seal places that would otherwise involve high tooling costs or cannot be sealed at all with conventional seals. Extruded profiles from the Freudenberg

Sealing Technologies portfolio can be supplied as yard goods, profile pieces or profile rings.



CORDS AND HOLLOW CORDS

The use of cords and hollow cords allows more freedom in the design of parts and installation spaces. The application of hollow cords causes low contact forces, which can be helpful during assembly. Freudenberg Sealing Technologies offers standard variants between 1.6 mm and 40 mm. Furthermore, special designs and variants with reduced tolerances can be developed and manufactured. A broad portfolio of high-quality materials with the relevant approvals for the process industry is available for the production of cords and hollow cords.

BENEFITS AT A GLANCE:

- Low contact forces
- Special designs with reduced tolerances available
- Broad material portfolio with the relevant approvals for the process industry



SQUARE AND X PROFILES AND CUSTOMIZED DESIGNS

Other possible special designs can include x-shaped or square profiles. On request, these can be manufactured with reduced tolerances at Freudenberg Sealing Technologies. As already explained on page 4, Freudenberg Sealing Technologies offers a wide range of development and testing options for customer-specific profile designs. As with cords and hollow cords, a broad portfolio of high-performance materials with the industry-specific approvals for the process industry is available.

BENEFITS AT A GLANCE:

- Manufacturing with reduced tolerances possible
- Wide range of development and testing possibilities
- Consulting expertise



INFLATABLE SEALS

The functional principle of inflatable seals lies in the pneumatic activation and deactivation of the sealing function. The seal adapts to the mating surface when activated, allowing compensation of unspecified, variable or very large sealing gaps. Pressures of up to 3 bar can be achieved with standard variants. By means of activation and deactivation, caps, doors, hatches and entry areas can be opened and closed without much effort. The applications in the process industry are wide-ranging – from oven doors in food production or airtight doors in pharmaceutical coaters to sterilizers, mixers, dryers or filling systems for bulk materials. Inflatable seals can be used in both static and dynamic applications. Due to the low requirements concerning the design of the installation space they are often a more cost-effective solution than conventional seals. The goal is always the same: to safely protect containers and doors from germs, dirt and other external influences as well as prevent the exit of operating media.



Axial connection



Connection radial-out



Connection radial-in



There are various requirements placed on the materials used for inflatable seals such as high elasticity and tensile strength. In addition, they need to seal reliably even when exposed to aggressive media and under the influence of aging. To meet these varying and individual application conditions, Freudenberg Sealing Technologies offers a wide range of inflatable seals with versatile connection options (radial-in, radial-out and axial) and valve types (e.g. hose stopcock valves with flat key, housing valves or screw valves). Removable and thus reusable valves are also possible.

The experts at Freudenberg Sealing Technologies can also develop customer-specific inflatable seals with a possible pressure load of up to 10 bar at the customer's request. Extensive FEM calculation options and a comprehensive materials portfolio with industry-specific approvals can be used. The picture on the left shows an example of a combination of a metal ring permanently installed in the machine and an elastomer profile. The elastomer component was produced using injection molding. This allows greater flexibility in the choice of material and use even for smaller installation spaces where the curvature of an extruded profile could lead to difficulties. Other individual developments include special sealing solutions for dusty environments in the food industry. Due to the lack of folds in the profile, dust cannot settle and thus the functioning of the application and the continuous inflation and release of air is ensured.

BENEFITS AT A GLANCE:

- Possibility to compensating unspecified, variable or large sealing gaps
- More cost-effective alternative compared to conventional seals
- Wide range of applications within the process industry
- Different connection options and valve types available
- Customized developments possible
- Comprehensive material portfolio with the relevant approvals for the process industry
- Consulting expertise

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