Parker Prädifa

ENGINEERING YOUR SUCCESS.

November 2013

EMG report

Magazine for Customers of the Engineered Materials Group Europe

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EMG Report

The “EMG Report“ is a magazine for customers of the Engineered Materials Group Europe.

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Nomen est omen: the name is a sign

Dear customers and business partners

After 28 years of the „SealingReport" you are now holding a new issue of our customer magazine in your hands. For the first time, not only its contents but also its title reflects how we have continually been extending and complementing our product range in the past years. Naturally, seals, sealing systems, EMI shielding solutions as well as O-rings and moulded parts will continue to be our core products. But you – our customers – are making ever new and additional demands on your own products, systems and solutions, resulting in challenges which we are always pleased to tackle together with you. To better communicate our increasingly wide portfolio we have given ourselves the name Engineered Materials Group and, accordingly, adopted a new title for our customer magazine, which is now called **"EMG Report".** More on the range of products and services offered by the Parker Engineered Materials Group and the new name can be found on page 12 of this issue.
We can look towards the future with great confidence, as new product programmes and series production orders from a large number of strategic markets are assuring continued growth in the years ahead. On page 4 you can read how we keep investing in our European locations in order to strengthen the competitiveness of our products, and therefore the competitive edge of our customers, through state-of-the-art manufacturing technologies. At our Czech plant in Sadská, for example, we launched a new clean room facility this summer with additional capacities for products requiring Class ISO 7 to ISO 9 clean room production.
But we are not only continually investing in our European manufacturing locations and state-of-the-art production facilities but in our employees as well. On pages 34 and 35 we are pleased to present to you a number of new colleagues who will provide you with expert consultancy when it comes to finding the best product solution for you and serve as your partners in the joint development and realisation of your project. An example of such a product development is described on page 25. It concerns the hot topic of developing the best suited sealing materials for the refrigerant R1234yf used in automotive air conditioning systems. The development work of our application engineers, material laboratories and related production operations in concert with our customers leads to modern and efficient products. In keeping with our promise:

ENGINEERING YOUR SUCCESS.

Enjoy reading the new issue of our EMG Report.

Jochen Nigge
General Sales Manager
Engineered Materials Group Europe

Purely for medical and pharma products

Parker-Prädifa plant in Sadská now with state-of-the-art clean room production

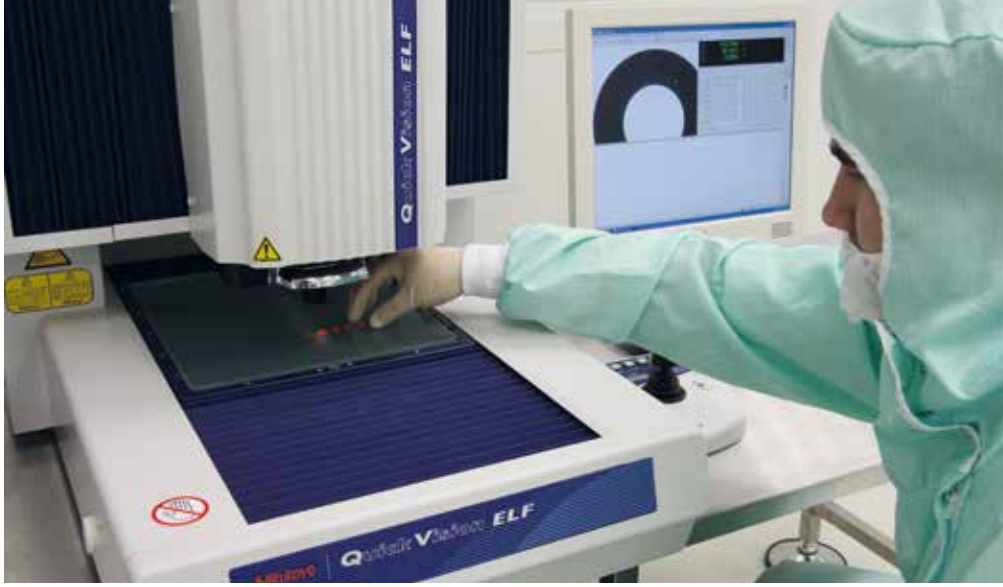
Berthold Röhrich,
Market Manager Life Science,
Engineered Materials Group Europe

Since June 2013 Parker-Prädifa has been operating an ultra-modern clean room cell at its Czech location in Sadská. The 130-square metre facility offers extensive possibilities primarily designed to meet the exacting demands of the medical and pharmaceutical industries. The central focus of the operation is on manufacturing custom solutions made of elastomer and plastic components developed at the German locations Pleidelsheim and Bietigheim.

The GMP-conformant clean room cell consists of several ISO 7 to ISO 9 class clean rooms and has been designed to allow for a quick and easy extension of the facility as needed. A connection of manufacturing cells exclusively dedicated to custom products (such as high-volume 2-component solutions or component assemblies) is possible as well.

Latest-generation injection moulding technology

Injection moulding technology using latest-generation machines for various materials such as silicones (LSR and HCR), TPE and other elastomers is a key element of the cell. Specifically in LSR processing Parker-Prädifa draws on many years of experience which can now be increasingly used for medical technology and pharmaceutical applications due to the new clean room cell. Even 2-component solutions (e.g. silicone/plastic or TPE/plastic) are possible in clean room class 8.
To cover the growing demand for high-precision, particle-free moulded



parts and seals, not least driven by the unbroken trend toward further miniaturisation in medical technologies, a new automatic micro-injection moulding machine in cleanroom class 7 is available. Even high-transparency liquid silicones can be processed here.

Over-moulding for single-use systems

For pharmaceutical industry customers the over-moulding technology available at the location is of particular interest. It is used specifically for so-called single-use systems, primarily to combine silicone and TPE tubes with other plastic components or various tubes with each other. These components, for example, include aseptic connectors, filters and transport containers. Among other things, these systems are subsequently used to extract samples in vaccine production. Cable ties are still frequently used for these component assemblies but this generally harbours a higher risk of leakage. This risk can be significantly reduced by means of over-moulding technology.
In view of the higher costs of over-moulding compared to cable ties, Parker-Prädifa offers both options. Particularly in the case of systems used in less critical process areas a cost-benefit analysis together with the user makes sense in many cases. The general rule that applies here is: the closer the system comes into contact with the customer's final product the more sensible is over-moulding. The higher costs for this form of assembly are no longer in proportion to those incurred by the pharmaceutical company in the event that a batch is contaminated or tampered with in one of the final production steps. Furthermore, Parker-Prädifa offers the sterilisation of these systems with external partners. This option provides end customers with a sterile, ready-to-use solution.

Purity in assembling plastic components

Another focal point of the cell's activities is the assembly of plastic components. As well as conventional bonding or gluing, ultrasonic welding work is performed in clean room class 7. Apart from the high reproducibility the fact that no additives are required is a major advantage of this process which thus benefits the purity of the product. PTFE or PES diaphragms can be securely and reliably affixed to plastic components. Parker-Prädifa uses this technology mainly in the assembly

of products for clinical use in the area of infusion therapies. In this case, plastic components and sealing elements are economically combined into assemblies, with a data logger module recording all the critical process parameters. Another field of application is filtration.

Automatic measurement and monitoring

For class 7 and 8 clean rooms critical room parameters (temperature, relative humidity, pressure) are regularly measured and monitored automatically. The number of particles of a defined size per room unit is continuously checked as well. Filter units ensure air circulation of at least 25 cycles per hour.

Advanced quality assurance

Among other things, the equipment available for quality assurance includes a 3D microscope with a resolution of 0.01 µm (0.0001 mm), which has the capability to automatically record the measured results and to allocate them to a specific batch. For particularly critical moulded parts made of transparent silicone a cost-efficient 100 % inspection, for instance of the surface for particle inclusion and dimensional accuracy, can be performed using a testing machine. Defective parts are automatically sorted out, good parts conveyed on a belt to the packaging station.

Packaging options as needed

Various options are available for the selection and design of packaging the products manufactured in the clean room, from the simple PE bag and PETG single blisters with Tyvek covers through to moulded pallets. Factors such as product handling by the consumer, further processing or specific requirements for transport and warehouse logistics have a decisive influence on the type of packaging to be used.

Fast support for system solutions

In view of the increasing requirements in the medical technology and pharmaceutical industries the Parker Hannifin Corporation has been pursuing the targeted expansion of worldwide locations with clean room manufacturing facilities for years. With the new manufacturing cell in Sadská the growing quality requirements particularly of European customers can now be met as well through faster and better support of relevant system solutions. The Sadská location is currently certified according to ISO/TS 16949. Certification according to ISO 13485:2012 is planned for the beginning of 2014. ■

Event Calendar

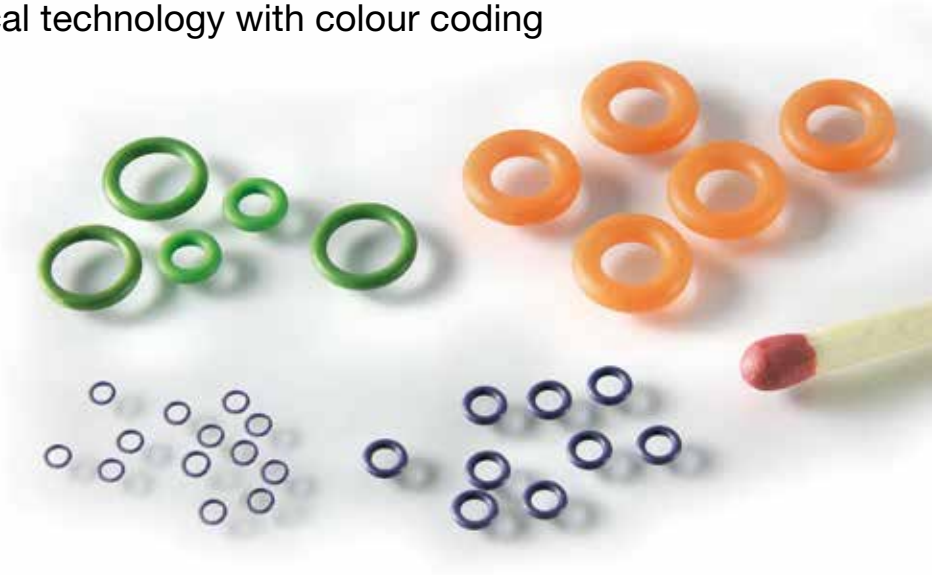
Pharmapack	Paris, France	19.02. – 20.02.2014
Elmia Automation	Jönköping, Sweden	06.05. – 09.05.2014
MIOGE Moscow Intern. Oil & Gas Exhibition	Moscow, Russia	25.06. – 28.06.2014
Powergen	Cologne, Germany	03.06. – 05.06.2014

We look forward to your visit.

Colour prevents mix-ups

Biocompatible O-rings for medical technology with colour coding

Berthold Röhrich,
Market Manager Life Science,
Engineered Materials Group Europe



For medical applications in which different types of O-rings are used colour coding is generally advisable. It helps to prevent mix-ups in the assembly process and the related risks. Colour coding is actually a must in the case of micro O-rings with a cord strength of less than 1 mm, as visually the rings can hardly be distinguished from each other.

Parker-Prädifa offers a wide range of colours specifically for silicone O-rings. The colour pastes used for this purpose have been tested and approved according to ISO 10993 and USP Class IV (see chart). They are mixed into the compound by means of a special metering device connected to the injection unit. Consequently, there is no requirement for major changes being made to the actual production process. By exchanging the relevant colour cartridge containing the paste a wide range of colours can be covered with minimal effort, and thus at low costs.

The O-rings offered by Parker-Prädifa are used in all kinds of medical devices. With a minimum cord strength of just 0.25 mm they meet the requirements resulting from miniaturisation, which continues to be an unbroken trend in many industries and particularly in medical technology.
Apart from the bio compatibility of the materials used Parker-Prädifa of course fully fulfils the cleanliness requirements that apply to products intended for medical use. Therefore, the production of seals as part of a "small" process takes place in clean room class ISO 7 (see also article on page 4). Sterilization of the products is possible as well.

Another interesting option – particularly for miniature seals – is the possibility to have them installed, for instance in customer-specific plastic housings. This type of assembly work is done in clean room conditions too.

The installation of the seals at Parker-Prädifa can be effectively coordinated with the production process of the seals. As a result, the customer receives a complete assembly in a particularly efficient way. It eliminates the customer's need to handle the seals in its own process which, especially in the case of miniature seals, is typically a highly complex task. ■

	Colour	Similar to RAL	BfR	FDA	ISO 10993	USP Class VI
	Yellow	1016	•	•	•	•
	Yellow	1026	•		•	•
	Orange	2004	•	•	•	•
	Red	4002	•	•	•	•
	Blue	5010	•	•	•	•
	Blue	5022	•	•	•	•
	Blue green	6004	•	•	•	•
	Green	6010	•	•	•	•
	White	9010	•	•	•	•
	Black	9011	•	•	•	•

Coatings in medical technology

Targeted improvement of material properties for exacting demands

Products for medical technology make various demands on the materials used in them. They must be biocompatible and abrasion-resistant, withstand mechanical loads and not cause inflammatory or allergenic effects. In addition, low friction, corrosion resistance and stability in multiple sterilisation cycles are required. Appropriate coatings play a major role in this regard. Parker already offers a wide range of materials for medical technology including elastomers with biocompatible coating. The following article takes a look at the various properties and effects of modern coatings in this sensitive field.

Dr. Gerhard Haas,
Compound Development
O-Ring Division Europe

Whenever a medical product comes into direct contact with living tissue or body fluids the initial interactions between the medical device and the biological material occur in the surface contact area. Therefore, the direct influence on the properties of this contact zone is one of the key attributes for coatings used in medical technology. For the highly diverse applications in medical technology a wide range of materials is available today (Figure 1). With respect to their adhesive strengths alone these materials make different demands on the coatings, which call for modifications of the coating method as well as the polymer used.

Figure 1: Materials used in medical technology

Medical technology makes diverse demands on materials. As these products interact with the human body they must be biocompatible as well as abrasion-resistant and capable of withstanding mechanical loads. Inflammatory or allergenic effects must be excluded. In addition, the materials have to resist multiple sterilisation cycles, be corrosion-resistant and exhibit low friction. These exacting requirements can be met by means of modern coatings. Figure 2 shows properties which modern coatings used in medical technology must have.

Table 1 shows examples of typical medical products for which the application of an appropriate coating can achieve a targeted improvement of the material properties or introduce additional properties. A distinction can be made between short-term/temporary and long-term/permanent applications.

Presented below are the three main categories into which coatings for medical devices can be divided:
1. Passivation
2. Physical-mechanical coatings
3. Antimicrobial coatings

Passivation

The inherent incompatibility with blood or tissue of many artificial materials used in medical technology, such as plastics, ceramics or metal alloys, poses a major problem. For example, an interaction between the polymeric surface and blood may provoke a defensive reaction by the patient's immune system. Even a non-permanent adsorption of proteins to the surface of the material may lead to a change in the protein conformation and thus cause undesirable side effects. Therefore, the ability to control, delay or – ideally – inhibit the adsorption of proteins to the surfaces of medical devices is a central objective of passivation.
Up to now, this has mainly been achieved by the adsorption of polymeric surfactants which have hydrophilic groups on the surface. The resultant higher hydrophily minimises the interactions between the substrate and proteins. In relatively static application conditions this coating has proved to be very effective. However, there is a risk of polymeric surfactants being extracted or leached out. Another type of passivation is achieved by means of a heparin surface. This type of coating, though, involves a high level of complexity with respect to producing and applying the heparin.
Other passivation coating systems contain biomimetic approaches such as the integration of phosphorylcholine in the polymer matrix.

Physical-mechanical coatings

Another class of coatings for medical devices specifically targets physical-mechanical properties. They include functions such as chemical, moisture and electrical barrier properties as well as tribological properties. Hydrophilic anti-friction coatings such as ComfortCoat® and PhotoLink® (Hydromer Inc., www.hydromer.com) are used for cardiovascular guide wires and catheters as well as for urinary catheters.
Hydrophilic coatings, compared with hydrophobic materials, are

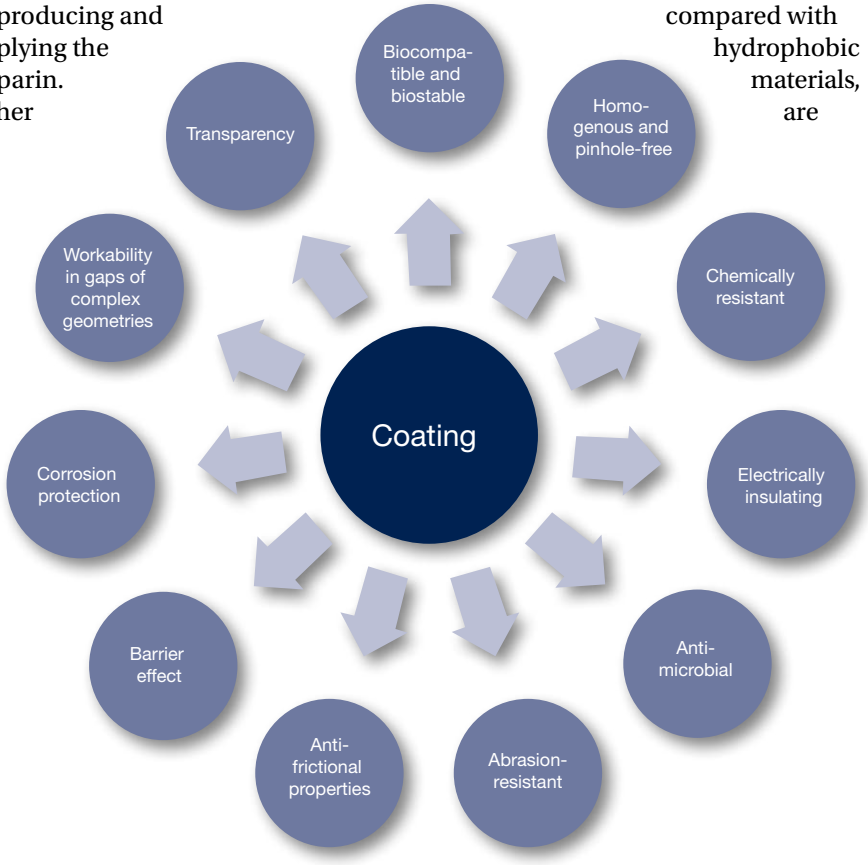


Figure 2: Properties of coatings used in medical technologies

generally known for lower protein adsorption. Hydrophobic coatings include Parylene coatings. Parylenes form a "pinhole"-free layer which can be applied as a very thin coat. This type of coating offers very good protection against moisture, chemicals and all types of body fluids. Furthermore, FDA-conformant PTFE coatings are used. In highly dynamic applications the aspect of particle abrasion must be observed with these coatings. Other methods for surface modification are fluorination and chlorination. As each of these techniques has specific advantages and disadvantages, a targeted selection must be made for the particular application.

Antimicrobial coatings

There is a large number of antimicrobial coatings which are either already available on the market or currently in development. Some of these systems are based on antimicrobial substances which are released by the coatings. These can be organic substances (such as triclosan) or anorganic substances, most commonly silver ions (Ag^+). However, these techniques that use diffusible antimicrobial substances harbour a potential risk of inducing resistances against antibiotics, as these products continually provide active compounds to their environment.
Although currently only few organisms exhibit a resistance against Ag^+ o Cu^+ ions the increased exposure of microbes to these compounds will inevitably lead to higher resistances against treatments in which these substances are used.

Wide range of certified materials

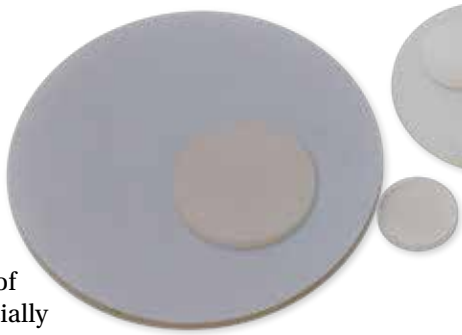
The products of the Parker Engineered Materials Group for medical technology are mainly focused on applications requiring a contact duration of < 30 days (contact duration group B). Parker already offers a very wide range of materials which are certified according to DIN EN ISO 10993 and USP VI. The currently available materials belong to the families of ethylene propylene dien monomers (EPDM), fluoroelastomers (FKM), perfluoro-elastomers (FFKM), liquid silicones (LSR), solid silicones and polyisoprenes. But Parker always welcomes customer-specific new development or material modification projects which are carried out in close collaboration and intensive exchange of information with the customer.
Parker additionally offers elastomers with a biocompatible coating, which can reduce friction or improve chemical resistance. This coating with strong adhesive properties can also be used as an installation aid.
Generally, when selecting materials for applications in medical technology, it must observed that, especially in the case of elastomers (such as FKM), the sterilisation method planned for the product has a major influence on the durability of the material. ■

Contact duration	Application	Objective
Short-term/ temporary	Medical seals	The coating can be used to eliminate stickiness, augment mechanical strength, introduce dry lubrication or increase chemical resistance.
Short-term/ temporary	Catheters	The coating increases the lubricity of the surfaces and protects the contact area against potentially corrosive bio fluids.
Short-term/ temporary	Guide wires for catheters	A coating for catheter guide wires primarily serves to facilitate the introduction of catheters and to protect the lines against potentially corrosive bio fluids.
Short-term/ temporary	Pressure sensors and transducers	Among other things, the coating for sensors protects the sensitive elements without interfering with the functionality of the device.
Short-term/ temporary	Mandrels	The coating reduces the friction coefficient, achieves a particle-free surface, prevents microscopic chipping and, in the case of elastomer parts, increases the service life of the mandrel.
Short-term/ temporary	Cerebral probes	Cerebral probes benefit from the enhanced lubricity of the coating and are provided with a selective insulation to maintain their conductive function.
Short-term/ temporary	Needles	An effective coating should seal micro-porosities, minimise puncture traumas (through improved lubricity) and evenly cover both the inner and outer side of the needle without measurable dimensional changes.
Long-term/ permanent	Electronic circuits	The coating should protect the surface against moisture and corrosive biological influences and insulate electrically conductive elements.
Long-term/ permanent	Heart-assist devices	A modified coating protects implanted heart-assist devices against corrosive bio fluids and insulates electrically conductive elements.
Long-term/ permanent	Pipettes, micro plates, carriers and covers	The coating should seal micro-porosities, protect the surfaces against corrosive bio fluids, moisture and chemicals, and lubricate the mounting of the product's cover.

Figure 2: Properties of coatings used in medical technologies

Biocompatible silicone/ PTFE sealing washers

Effective even after prolonged contact with various media



Parker sealing washers are mainly used in primary packaging of pharmaceuticals. This means that they are subject to special purity requirements. In order to exclude potential interactions with the product the materials also have to be biocompatible and the sealing washers obviously have to deliver reliable sealing performance. A technique developed by Parker-Prädifa, in addition to the required biocompatibility, ensures optimum adhesion and fit.

The demands made on primary packaging for food and pharmaceuticals have continually increased in recent years. Examples of particularly critical aspects are purity requirements and the exclusion of potential interactions with the product, i.e. the biocompatibility of the materials used in primary packaging. Especially in the food and pharmaceutical industries biocompatibility plays a major role as the migration of substances can change a product's properties. Parker's silicone washers are mainly used in primary packaging of pharmaceuticals such as glass bottles for transport and storage of active ingredients and medicaments. Consequently, they are part of the manufacturing process and thus critical for the quality of the final product.

Parker-Prädifa has developed a technique which makes it possible to vulcanise silicone sealing washers with a PTFE film in a way that ensures optimum adhesion and precise fit. A major advantage of this method is that it eliminates the need to use any adhesives and primers. Thus, the amount of Extractables & Leachables (E&L) can be minimised. This is particularly important when sealing washers come into contact with various media over a prolonged period of time.

The technique is equally suitable for single- and double-sided application of the coating. In terms of materials, customers can choose between peroxidically and platinum cross-linked silicones in various degrees of hardness and different shapes. However, due to the E&L issue Parker recommends platinum-based silicones. The PTFE film is available in various thicknesses from 0.025 mm. All materials meet FDA, ISO 10993 and USP Class 6 requirements.

At a glance

- Biocompatible materials
- Processing without additives
- Chemically resistant
- Suitable for sterilisation
- Flexible thickness of the PTFE film coating

Vulcanisation with PTFE gives the sealing washers particularly high chemical resistance. Furthermore, gas impermeableness is significantly improved, especially at room temperature. Installation and location of the sealing washers is facilitated as well, depending on the thickness of the PTFE film.

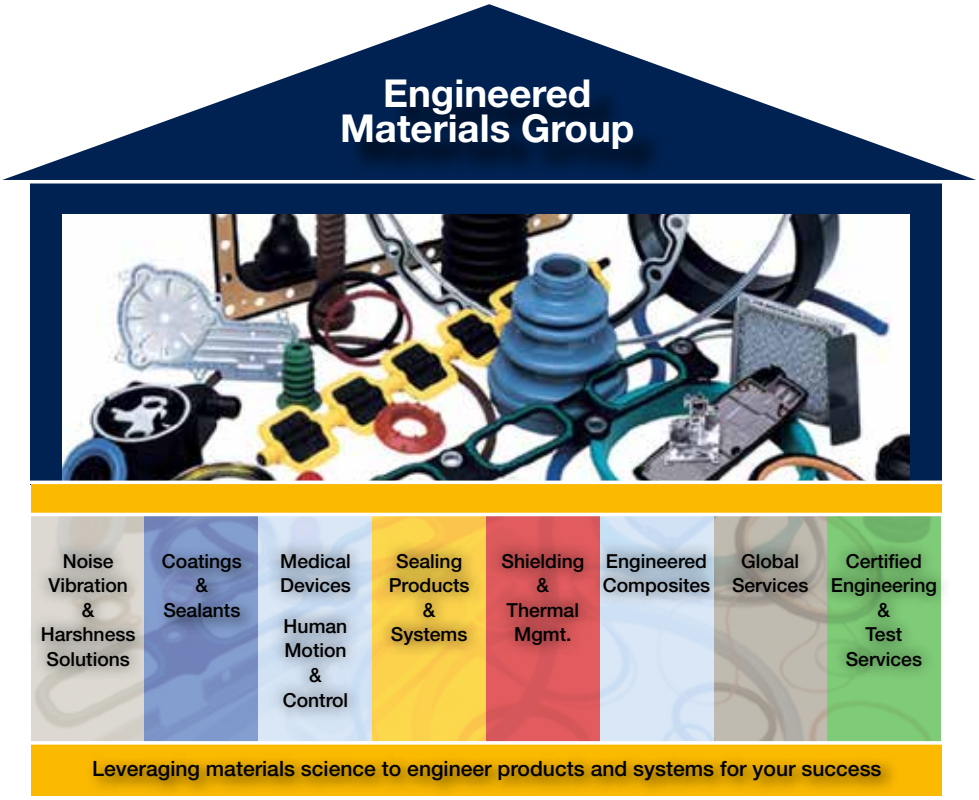
Of particular importance in pharmaceutical applications: The silicone/PTFE sealing washers can be sterilised by all commonly used processes (gamma, hot steam, ETO). In addition to their uses in the pharmaceutical industry, silicone/PTFE sealing washers are generally suitable for any application rated as primary packaging. ■

Seal Group is now Engineered Materials Group

New name represents broader scope of group's capabilities

At the beginning of August, the name of the Parker Seal Group was changed to the Parker Engineered Materials Group (EMG). While the group's focus will continue to be on sealing and shielding solutions for a broad array of markets and challenging applications, the new name better represents the materials science capability that has been developed over time as well as the complex manufacturing, process and application engineering that Parker can provide to its customers.

Parker has established an outstanding worldwide reputation as a developer and manufacturer of high-quality sealing and shielding technologies. Therefore, the decision to change the well-established name of the Parker Seal Group to the Parker Engineered Materials Group required careful consideration.



Why "Engineered Materials Group?"

While the group's previous name established a more direct association with its core business of sealing and shielding technology, the new name covers a much broader scope as Parker's capabilities have long expanded beyond seals into such areas as EMI shielding, thermal management and medical systems.

"The name change does not signal any fundamental change in strategy or direction for the group, the focus of which will continue to be sealing and shielding solutions for a broad array of markets and challenging applications," said Andrew Ross, Corporate Vice President and President of the Engineered Materials Group. "The new group name," Ross emphasized, "accommodates what we envision as a more expansive future growth platform designed to offer customers a broader range of solutions and services."

Parker's decision to change the Seal Group's name into Engineered Materials Group does not imply a reference only to the formulation of materials but also to the group's unique design capabilities in critical applications and systems which Parker expects to accelerate in the future on a more global basis. Furthermore, Parker is planning to broaden its capabilities in key areas such as Test Services, Global Services, NVH (Noise,Vibration and Harshness) and composites in an effort to increase the value delivered to its customers and distributors in Europe and worldwide.

Brand names to be retained

While the name of the group has changed, Parker will maintain its highly valuable Parker Prädifa and Parker Chomerics brand names as appropriate. Customers will notice the transition to the Engineered Materials Group as the new name starts to appear on invoices, brochures, business cards, news releases, signage and other materials that identify the group. ■

Worldwide – where you need us

Engineered Materials Group Manufacturing Locations

Aspects that influence qu

Dr Ir Eddy Vanswijgenhoven in an interview wit

In a series of articles focused on sealing technology, fluid magazine in its June to September 2013 issues looked at questions centred on the topic of "Low-Cost Machine Elements with Increased Risk Factors". Part 2 addressed manufacturing-related influences on the quality of an elastomer seal. Eddy Vanswijgenhoven, General Manager of the Packing Division Europe, answered the editor's questions.

fluid: Various production methods are available to produce elastomer seals. Is the method used irrelevant to the quality of the final product or should the design engineer indicate the manufacturing method to be used on his bill of materials?

Vanswijgenhoven: The method in fact has an influence on the quality of the final product in many cases.
However, from the perspective of the seal developer and seal manufacturer, I recommend that designers on the users' side let us initially select the method because, naturally, we have the most comprehensive subject-matter experience in this respect. Furthermore, we obviously have an extremely keen interest ourselves in manufacturing our seals for our customers in the simplest and most cost-efficient way possible on the one hand and at consistently high levels of quality on the other. Once the product performs well in the field application its production should largely be "frozen": for instance with respect to the method, machines or machine groups used, raw materials and intermediate products, processing parameters and much more.

fluid: What manufacturing parameters actually influence the performance of a seal and to what extent can a designer rely on a manufacturer's seal with a specific product name having the same quality with respect to the relevant criteria for ever and ever?

Vanswijgenhoven: Firstly, permit me to comment that, according to my knowledge, there is no such thing as "for ever and ever" when it comes to total equality in all aspects in any area. In a manner of speaking, this is a "a law of nature" that applies to industrial technology as well.
It goes without saying that our customers can rely on the fact that we are doing everything within our means – and of course in line with our obligations as a certified manufacturer as well – to supply them with products of consistently high quality, which thus conform to the promised relevant properties.
When it comes to the production of seals there are dozens of parameters that may influence a seal's performance. For example, temperature, pressure and time as well as the combination of these three factors plus numerous parameters relating to the material and the machine play an important role.
Ultimately, though, the performance of a seal in a concrete application case not only depends on the selection of and adherence to the relevant manufacturing parameters but starts by setting the right direction in the design stage. Therefore, we recommend that designers on the user's side – assisted by appropriate consultancy by our application engineers as needed – use "worst-case" requirements for orientation when designing a sealing solution.
A robust design coupled with a robust development process, with respect to the product itself as well as its production process, offers the best possible assurance.

fluid: Like others in industry, seal manufacturers have been relocating their production operations to the Far East. Does this adversely affect the quality of the final product? Because local raw materials or intermediate products are often used in China or India.

Vanswijgenhoven: Your question suggests that Chinese or Indian raw materials are of lower quality than the ones used here. But this is not necessarily the case. Even in Europe raw materials and intermediate products from China and India have been in use for some time. Basically speaking, it is of course true that the use of raw materials or intermediate products of lower or inconsistent quality has a negative effect on the quality of the final products or results in greater variance. But this is a general truth and therefore irrespective of a material's origin. A solid and consistently practiced receiving inspection of raw materials or intermediate products is the appropriate solution.

fluid: As the saying goes: Trust but verify. Can the quality of a seal be visually evaluated and what mechanical tests can reveal non-conformances with respect to the compound formulation or manufacturing process?

Vanswijgenhoven: To assure a very good quality of finished parts, several inspections or tests are required. For one, the visual inspection is the simplest quality assurance technique to determine surface defects (e.g. flow lines, cracks and streaks) or foreign particles. The presence of any of these may already provide an indication of possible processing problems. However, when it comes to assuring quality in terms of the right compound or formulation being used this inspection is insufficient.
In this respect, for example in the case of rubber, density and hardness (provided that this is possible on the component) should initially be tested and compared with the sampled material. If significant differences are noted at this point (deviations of more than 0.03 from the required value in the case of density) the analysis can end right here.
Otherwise, an additional TGA (thermogravimetric analysis) and an IR test (infrared spectroscopy) should be performed on a random sample and compared with the results of the material that was originally sampled. This approach should then provide final clarity about the material's identity and a potential deviation in the formulation.
A non-conformance of the manufacturing parameters ultimately affects the quality of the network density. Depending on the geometry of the article, this can be tested based on the compression set or tension set. Furthermore, a visual inspection of the component cross-section should be performed, as with some materials a foam-like structure in the profile core can develop as a result of insufficient crosslinking.

fluid: When it comes to storage, elastomers are very sensitive. If, for example, the UV stabiliser content is reduced for cost reasons, this may have a considerable impact on the storage stability. How do you inform your customers of a change in formulation and is there a definition of what a reportable formulation change is?

Vanswijgenhoven: Actually, these are two questions. Therefore, let me initially address the first one.
The content of UV stabilisers in rubber seals is relatively low – approximately in the range of 1 per cent. To try and save some money there at the expense of risking problems with storage stability does not make a lot of sense from my point of view.
Now to respond to the second question: We have committed ourselves to compliance with the general requirements of ISO TS 16949. This means that product and process changes have to be reported. With respect to formulation changes there is a distinction made between those to be reported (major change) and those which do not have to be reported (minor change). However, not least due to the complexity of the subject matter, there are no firm or generally applicable rules for this. Therefore, with our comprehensive and long-standing experience in materials and process technology, we evaluate the reportability of product or process changes on a case by case basis in the spirit of the standard and naturally inform our customers in accordance with the requirements imposed on us.
Again, analagously to what I said at the beginning, let me reemphasise that as a seal manufacturer with high quality standards we naturally fulfill our obligations of informing our customers as well. Reliability across the entire process chain through to series production is our top priority and this is what our customers can rely on.

(Interview published in fluid magazine, issue 7-8/2013)

Dr Ir Eddy Vanswijgenhoven
General Manager,
Parker Hannifin Manufacturing Germany GmbH & Co. KG,
Packing Division Europe

Eddy Vanswijgenhoven has been General Manager of the Packing Division of the Parker Engineered Materials Group Europe since April 2009. The Packing Division Europe develops and manufactures sealing systems for dynamic applications. The headquarters of the Packing Division is located in Bietigheim-Bissingen near Stuttgart (Germany). Other plants are in Boom (Belgium), Helsingør (Denmark), Sadská (Czechia) and Glasgow (Scotland).

Sealing systems in gas springs

Enhancing comfort in everyday life - improving productivity in industrial uses

Stefan Reichle, Market Unit Manager
Industrial/Consumer/CPI,
Packing Division Europe

Gas springs that enhance comfort are found in a wide range of consumer goods and everyday devices. But in industry, as well, gas springs are increasingly being used to improve process reliability and efficiency. To deliver dependable performance in their respective applications, all gas springs require an absolutely reliable sealing system that corresponds exactly to their specific requirements profile. Parker-Prädifa offers an extensive range of materials and sealing solutions tailored specifically to use in gas springs. It has been successfully proved in millions of these devices. With a new generation of high-performance compounds and the newly developed GS rod seal this range has now been extended yet again and comprehensively meets the continually growing demands made on lifetime and actuating frequency.

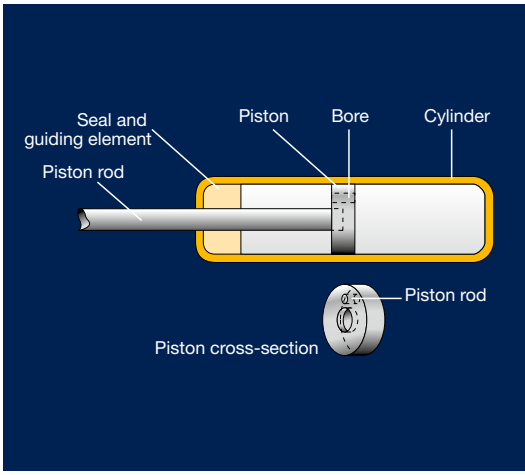
Gas springs are used in ever new fields of application year by year and have become an integral component of everyday life. These silent helpers, for example, assist us in achieving an ergonomically optimal seating position in our office chairs or let the boot lids and tailgates of our cars appear nearly weightless when we lift them, then gently slowing the downward motion when we close the lid. They create the desired engagement between a skier's boots and bindings and make it easier to move heavy loads in industry. No matter which mechanisms they operate in, gas springs provide effective cushioning and damping.

The functional principle

The gas spring is a pneumatic spring. It is energized by a highly compressed gas. The system, which is basically of a relatively simple design, consists of a cylinder, piston, piston rod and the closure package with the seal as its core elements. Initially introduced nitrogen generates the service pressure and a few cubic centimetres of – typically synthetic – lubricants assist in performing the desired function. The gas pressure acts on the cross-sections of the piston, which vary in size, and generates a force in the outbound direction of travel when the piston rod enters the the piston. The job of the rod seal is to protect the amount of gas that has been introduced into the cylinder from leakage and to thereby prevent loss of the spring's functionality.

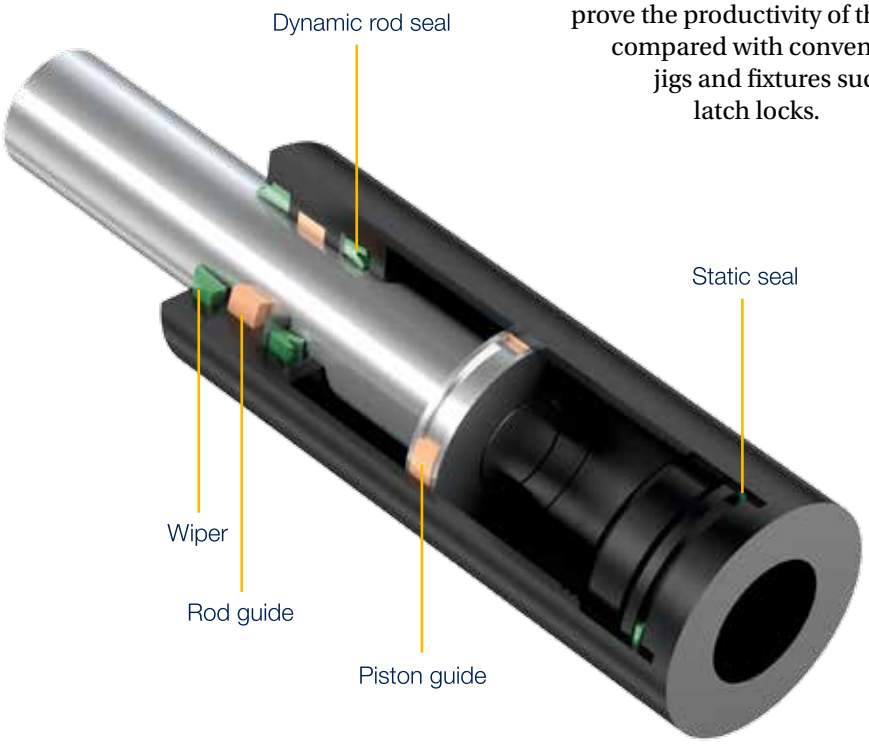
The right seal for any task

Factually, the originally introduced gas volume, due to permeation and interface leakage loss, is slowly but surely degraded down to the failure limit, unless the seal prevents this. Therefore, a targeted look at the relevant tribological system, including the selection of a suitable seal, is of utmost importance. The major requirements for industrial and comfort gas springs are briefly described below.



Industrial gas springs

Industrial gas springs are frequently found in tool-making operations. While in the past they were primarily used in cutting and stamping tools, they now operate in injection moulds as well. During the additional movement of a tool plate, when the mould opens, they increase process reliability and thus improve the productivity of the system compared with conventional jigs and fixtures such as latch locks.



Sealing system of an industrial gas spring

Millions of strokes

The use of gas pressure springs in tool-making operations makes special demands on the requirements of the spring's sealing system, such as long service life, which means a guaranteed number of strokes of 1 to 2 million while the force remains consistent. The seals have to ensure maximum gas tightness and uniform friction across their entire lifecycle.

High pressures

Due to the compact shape of the spring both the static and the dynamic seal in the spring have to withstand the inevitably high gas pressures of up to 500 and 600 bar while delivering full functionality. The tailored specialty seals by Parker-Prädifa, which are manufactured from particularly well-suited and time-tested high-performance polyurethane compounds polymerised in-house, have proved to be extremely viable for these applications.

“Strong guidance” required

To avoid damage of the seal contact surface the guiding elements have to reliably prevent metallic contact between the moving piston rod and the pressure housing. Especially in stamping and deforming tools the guiding tapes have to be able to absorb extremely high lateral forces without losing their geometry and dimensional stability. High load cycles must not lead to guide wear and thus an enlargement of the radial guide clearance, as this causes a higher loss of gas and could thus result in premature failure of the gas spring. In harsh operating conditions fabric guiding tapes impregnated with phenol resin, which are produced in a high-accuracy machining process, have proved to be viable. They are very easy to handle and available in any desired size.

No drag-in of foreign substances

Besides the seal and guiding element the wiper as a component of the sealing system plays a key role for the service life of the gas pressure spring. It protects the seals, guiding elements and other components of the gas spring from dirt and the consequent wear. In addition, the wiper prevents foreign substances being dragged into the gas compartment. Incompressible foreign substances (e.g. fluids or foreign particles) that enter the compartment reduce the compression volume. The resulting excess pressure can cause the gas spring to explode. Apart from premature wear of the seal, drag-in of foreign substances into the gas compartment poses the greatest failure risk to gas springs.

Comfort gas springs

Unlike industrial gas springs comfort gas springs are mainly used for retaining and facilitating motion in everyday devices. Typically unnoticed, comfort gas springs make our daily lives easier when opening and keeping open the doors of kitchen cupboards, windows or vehicle tailgates and bonnets. They support our health during our workouts on steppers or treadmills. But also in demanding applications such as aircraft engineering, medical technology or when installed in seats, doors or tables, they enhance everyday comfort.

Simpler design – higher demands

Compared with industrial gas springs the extension lengths of comfort gas springs are typically longer and the forces lower. Apart from reducing the size of the installation space this makes it possible to reduce the number of the required components as well. As comfort gas springs are frequently found in environments that tend to be cleaner than industrial ones and the lateral forces that occur in the applications are typically lower than those of industrial gas springs, additional components such as complex guiding systems or wipers against ambient media are not necessary in many cases.

Yet the basically simpler design of such systems does not mean that the seals or guiding elements used in them have to meet lower requirements. Instead, due to the smaller housings, the demands made on a sufficiently long service life of the components and thus the gas springs themselves in many cases even exceed those made on industrial gas springs.

Sealing system of a comfort gas spring

Seal geometry and compound – the right fit for any application

Parker's sealing compounds prove their viability in the form of rod and piston seals as well as O-rings produced using hot runner (sprueless) gating in static and dynamic functions in millions of gas spring applications. Parker-Prädifa offers the right seal geometry and suitable material for any field of application, from low-cost NBR, to HNBR and FKM high-temperature seals through to highly wear-resistant and – if required – a polyurethane sealing solution that is cold-optimised down to -55 °C. A new brochure provides a detailed overview of all available Parker-Prädifa sealing elements for industrial gas springs and comfort gas springs with product properties and the relevant recommended materials:

New GS rod seal – the specialist for use use in gas springs

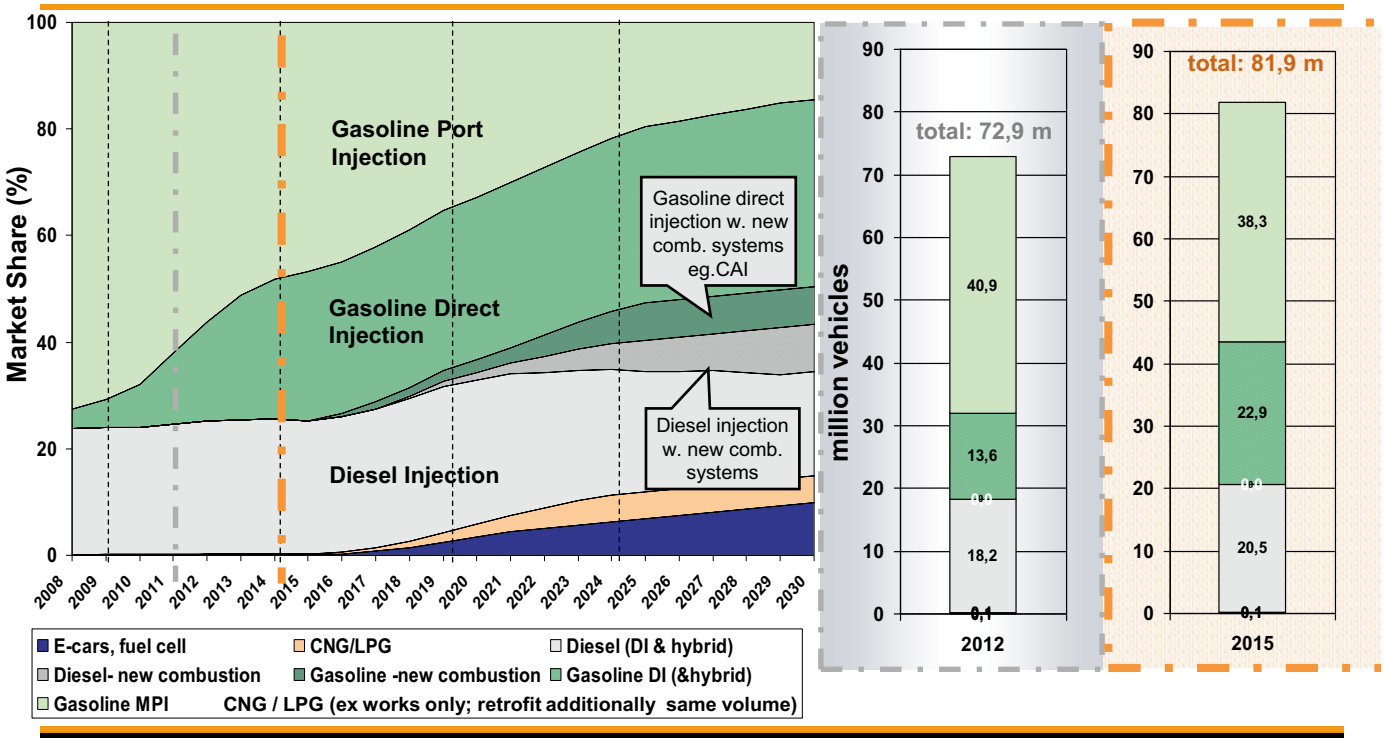
The GS rod seal has been specifically developed for the high demands in gas spring applications, i.e. small housings, long service life and maximum gas tightness at low friction. Besides for their uses in gas springs, these properties also recommend the seal for applications in hydraulic and pneumatic equipment that make the same demands. The short contact area of the sealing surface guarantees low friction. Backup rings or retainers are not necessary due to the special geometry. Use in both hydraulic and pneumatic equipment with oiled air is possible. The GS rod seal is interchangeable with the time-tested C1 seal profile and fits into the same housings. Installation – in closed and undercut housings – is simple. For special requirements of the chemical process industry and the food industry suitable materials are available.

Automotive sealing materials

A commentary by
Bekim Berisha, Market Unit Manager Automotive,
O-Ring Division Europe

Media reports and other sources continually provide us with information about the market development trends for the various powertrain technologies in the global automotive market. Numerous forecasts and trends exist with respect to a shift in market share from conventional fossil fuel technologies towards alternative drive systems such as battery-powered electric or fuel cell vehicles. At Parker, these trends are monitored with great interest and proactively responded to with a large number of development activities in the relevant market segments. Still, like the majority of the car manufacturers, we are convinced that the conventional internal combustion engines continue to harbour major potential for further efficiency increases and with respect to meeting both current and future environmental standards aimed at reducing carbon dioxide emissions.

The chart (see below) showing an estimate based on the results provided by various sources illustrates the previous and future development of the worldwide market share of the various drive technologies.
It reveals that particularly the market share in the "Gasoline" segment, i.e. petrol engines, will continue to play a significant role in future. Not least due to these and similar development forecasts and in the light of consistently growing requirements in the various applications in petrol engines, such as injectors and high-pressure pumps, the Parker development team has specifically developed new, or further developed existing, FKM compounds that are in line with the development of the market as well as meeting the corresponding technical requirements. In parallel, Parker of course fulfils the sealing technology requirements of modern diesel engines, including the aspect of AdBlue®, as well as those resulting from the increasing use of bio fuels by offering a relevant range of materials and continually pursuing new and further developments in this field. Therefore, our customers in the automotive industry can always be sure to find the right sealing materials, which correspond to their own current developments as well as anticipating future market and technology trends, in Parker's portfolio. (See also technical articles in this issue of the EMG Report and issue 1/2013 of the SealingReport on the "Sealing materials in automotive engineering" group of topics.) ■



Source: Estimate based on EUCAR 2002, SV, VDA, OEM Feedback, CVA, Global Insight 9/2009

Specialist for fuels

New FKM compound combines superior tear resistance, low-temperature flexibility and excellent bio fuel compatibility

Heinz-Christian Rost,
Technology and Innovation Manager,
O-Ring Division Europe

Even though development and marketing of fully-electric vehicles is currently being accelerated worldwide for reasons of climate and resource protection, forecasts predict that internal combustion engines will continue to play a major role in the coming decades for a wide range of reasons (see also article and graph on page 21). However, technical innovations of conventional internal combustion engines, including the increasing use of bio fuels, lead to an array of – in some cases dramatically higher – demands made on materials. With the new FKM compound V8908-80 the resulting challenges to sealing technology can be convincingly mastered.

The new low-temperature FKM compound V8908-80 by Parker-Prädifa offers a 230-per cent improvement in tear resistance compared with the standard type V8880-80 – while retaining comparable mechanical and aging-related characteristics. This makes V8908-80 a material that is suitable for highly critical sealing tasks in automotive engineering, combining superior tear resistance, low-temperature flexibility and excellent bio fuel compatibility.

In focus: downsizing

The current efforts by car manufacturers striving to extract a maximum of power output from extremely small engines while achieving high levels of efficiency lead to a drastic increase of demands within the requirements profiles for materials used in highly critical applications, due to the design principles of such engines. For example, this applies to injection systems and high-pressure pumps. The focus in this context is increasingly placed on low-temperature performance in combination with excellent media resistance and superior tear resistance.

Excellent in low temperatures

In its properties profile the new Parker compound generation V8908-80 is comparable to the established V8880-80 compound type. V8908-80 is characterised by a well-balanced profile of the mechanical properties and, with a TR 10 value of -39 °C, exhibits excellent suitability with respect to the current low-temperature requirements for cold applications.

Outstanding tear resistance and compression set

For highly challenging applications V8908-80 was specifically developed to deliver a level of tear resistance never attained before. The outstanding result of this development: Compared with V8880-80 a relative improvement of tear resistance by more than 230 % has been achieved. V8908-80 thus exhibits a tear resistance of 21.4 N/mm – versus 9.0 N/mm of the V8880-80 compound. (See Figure 1.)

Furthermore, setting behaviour, by comparison, was clearly improved for V8908-80 as well. In a short-term test of compression set for 70 hours at 200 °C a relative improvement of 20 % was achieved with V8908-80. This excellent result continues even in the long-term test for 336 hours at 200 °C. (See Figure 2.)

Flexible at high temperatures

The new V8908-80 compound additionally brings its significant performance advantage to bear at high temperatures. In air storage tests of V8908-80 at 225 °C (short-term) and 200 °C (long-term) substantially improved changes in tensile strength are achieved. Therefore, in short-term storage at 225 °C, a relative reduction of over 50 % in the change of tensile strength can be realised.

The long-term storage test reveals even better results. Here a relative reduction of over 60 % can be achieved. Figure 3 shows the corresponding results.

Test	Standard	Dimension	V8880-80	V8908-80
Elastomer base			FKM	FKM
Colour			green	green
Hardness	DIN 53505	Shore A	80	80
Tensile strength	DIN 53504	N/mm²	13.1	11.9
Ultimate elongation	DIN 53504	%	200	219
Modulus (100 %)	DIN 53504	N/mm²	7.4	7,8
Low temperature properties TR10	ASTM D 1329	°C	-39	-39

Table 1: Physical properties of the new V8908-80 compound compared with the established V8880-80 type

	FAM A	FAM B
Isooctane	30.0	
Toluene	50.0	
Ethanol	5.0	
Diisobutylene	15.0	
Methanol		15.0
Deionisied Water		0.5
FAM A		84.5

Table 2: Composition of the test fuels

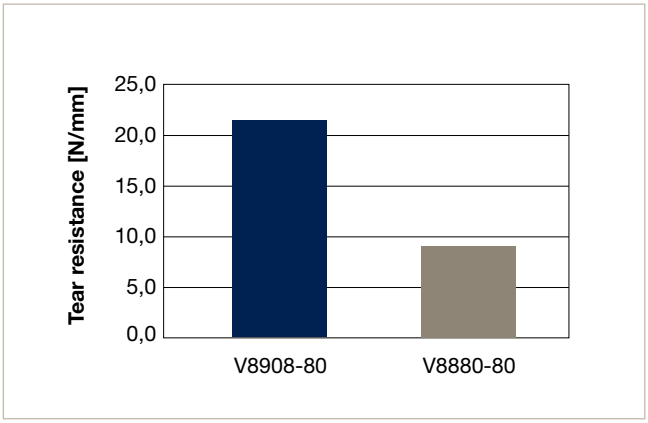


Figure 1: Tear resistance of the new V8908-80 compound compared with the established V8880-80 type

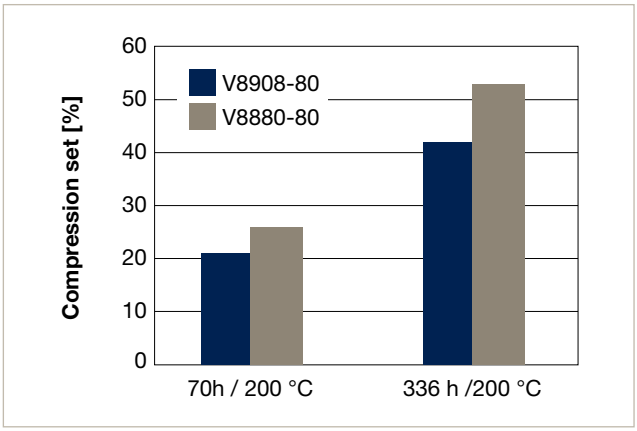


Figure 2: Compression set of the new V8908-80 compound compared with the established V8880-80 type

Armed for bio fuels

In addition to excellent tear resistance and very good cold flexibility, outstanding bio fuel compatibility rounds off the superior performance of V8908-80.

In their compositions, both test fuels contain polar media, with FAM B, due to the methanol content, being the test fuel to be rated as the clearly more aggressive "worst-case" fuel with respect to bio fuel compatibility. Figure 4 shows the storage values obtained with FAM A and FAM B. The storage period in either case is 70 hours at 60 °C.

In both test variants V8908-80 demonstrates its excellent resistance against bio fuels. The volume change of V8908-80 in the test with FAM B could be further improved and is now below 20 % - a value that is typically achieved only by FKM compounds with clearly worse cold flexibility, while the elastic properties exhibit a very well-balanced change profile.

Performance at many levels

Parker's innovative compound solution V8909-80 delivers compelling overall performance due to superior tear resistance in combination with excellent cold flexibility and very good bio fuel compatibility:
a combination that fully brings its power to bear in the most challenging applications and shifts the limits of sealing technology.

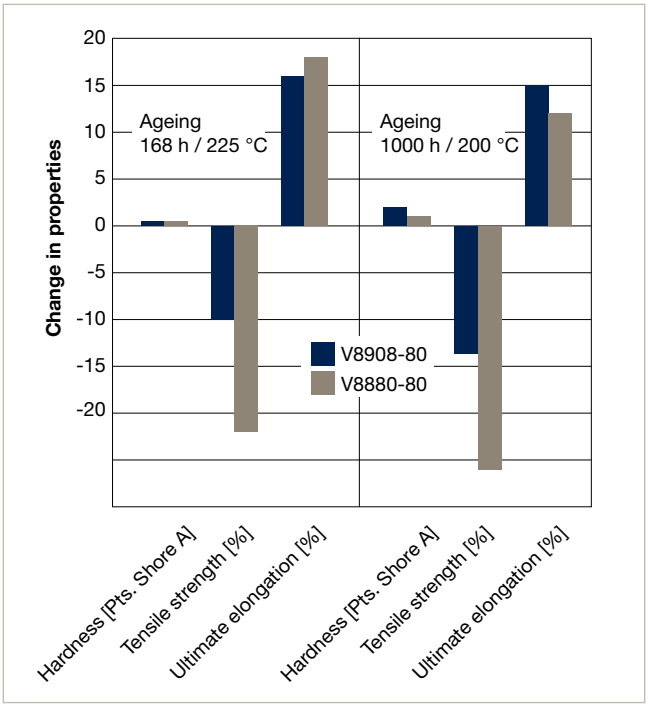


Figure 3: Change in properties, short- and long-term, of the new V8908-80 compound compared with the established V8880-80 type in air storage

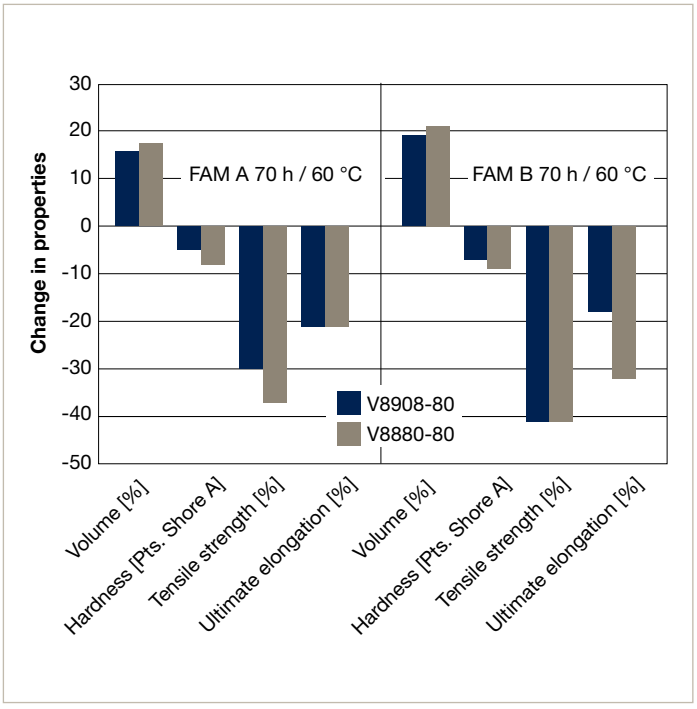


Figure 4: Change in properties of the new V8908-80 compound compared with the established V8880-80 type when stored in FAM A and FAM B

Refrigerants in automobiles: A hot topic for seals

EPDM and HNBR compound development for use with R1234yf

The introduction of the more eco-friendly refrigerant R1234yf in automotive air-conditioning (A/C) systems requires the further development of the EPDM and HNBR compounds typically used in these applications. The main focus of these developments is placed on permeation resistance in operating temperatures that are even higher than those of previous A/C systems and material compatibility requirements due to the chemical composition of the new refrigerant. As a material and sealing specialist with extensive experience in sealing automotive A/C systems, Parker develops suitable solutions in close cooperation with the automotive industry.

The information in this article is based on an article written for Automotive Engineering International (Sept. 2012) by Don Bowman, Manager of Materials Development, Composite Sealing Systems Division.

A few years ago, the automotive industry agreed on replacing the previously used refrigerant R134A that is harmful to the climate with R1234yf, a joint development by Honeywell and DuPont. With a Global Warming Potential (GWP) 335 times lower than that of R134A the new refrigerant meets the climate protection regulations of the EU and is also approved for use in Japan, the USA and other countries. However, the previously used refrigerant cannot simply be replaced with R1234yf in existing automotive A/C systems.

One of many system components of concern to the OEMs and aftermarket service providers is the elastomeric

seals used at the different joints in automotive air-conditioning. Critical aspects of seal performance, from a materials perspective, primarily concern the avoidance of permeation leakage and ensuring material compatibility due to the different chemical composition of the new refrigerant. The issue of permeation is exacerbated by the fact that operating temperatures in R1234yf A/C systems have increased even further compared with previous systems.

Criteria for the seal material selection

Most tube joint seals in current automotive A/C systems use materials based on EPDM (ethylene propylene diene monomer) or HNBR (hydrogenated nitrile) compounds. Due to their suitability for use in higher temperatures EPDM and HNBR compounds have replaced the previously used chloroprene compounds since about the mid-nineteen-nineties as the automotive industry began to introduce successive generations of more eco-friendly refrigerants, which increasingly demanded higher temperatures though. Both EPDM and HNBR compounds have proved to be suitable for use in automotive A/C systems. However, as in most sealing systems, the choice of material for applications in automotive A/C systems is ultimately a compromise based on the careful evaluation and weighing of multiple performance factors. To perform their jobs effectively, automotive tube seals in A/C systems must demonstrate:

- Permeation resistance in conjunction with the refrigerant chemistry used
- Degradation resistance in conjunction with the system refrigerant and lubricant
- Resistance against ambient influences (low temperatures, corrosion etc.)
- High-temperature resistance (due to the temperatures inside the A/C system or the environment)
- Compression set resistance within the system, as it is exposed to fluids and temperatures

The direct collaboration between a seal manufacturer with extensive automotive experience and OEMs is the best way to arrive at solutions that represent the best balance of all the aforementioned performance characteristics.

Particularly critical: permeation

Two types of leakage must be considered in determining the rate of loss of refrigerant from a seal joint: tangential and permeation. Tangential leakage occurs between the seal and the mating hardware. It can typically be reduced to a very low level by an optimal geometry of the seal.
The second type of leakage – permeation – occurs through the elastomer material itself. The relevant design parameter in this case is the seal's ability to resist permeation through the polymer network of its compound. Leakage in A/C systems is viewed as being particularly critical due to the large number of sealing joints in these systems. Consequently, even small leaks at individual joints can add up to a major overall loss of refrigerant. In addition to the high consequential costs, such as those resulting from damage to the compressor or dryer, the escape of refrigerant – as in the case of R134A and its predecessors – is harmful to the climate. To determine and compare the permeation of different seals in contact with the new R1234yf refrigerant, the Parker Engineered Materials Group used a gravimetric test method. In the corresponding tests the vapour transmission rates were measured at various temperatures using thin diaphragms made of a variety of EPDM and HNBR compounds (see table). The materials were also tested with the addition of the lubricant Nippondenso ND-8, one of the many lubricants typically used in air-conditioning systems. This made it possible to more closely replicate actual refrigerant operating conditions.

Dramatic increase at higher temperatures

The test protocols for all eight materials tested showed a dramatic increase of the permeation rates with increasing temperatures, presumably caused by increasing vapour pressure. Given the higher operating temperatures required for the R1234yf refrigerant, it is reasonable to assume that the seal permeation performance will become increasingly critical to automotive A/C systems designed for this new, environmentally responsible refrigerant.

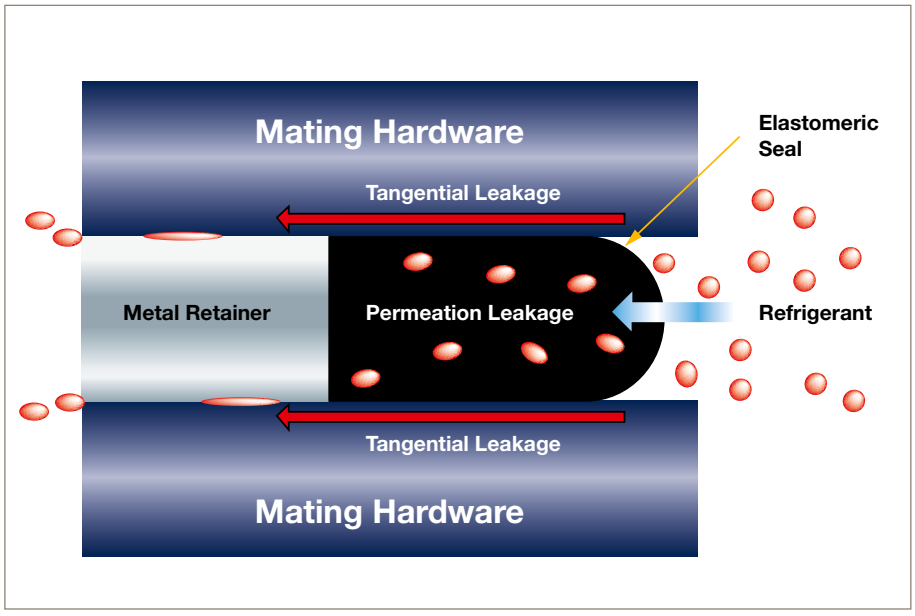


Fig. 1: Types of leakage

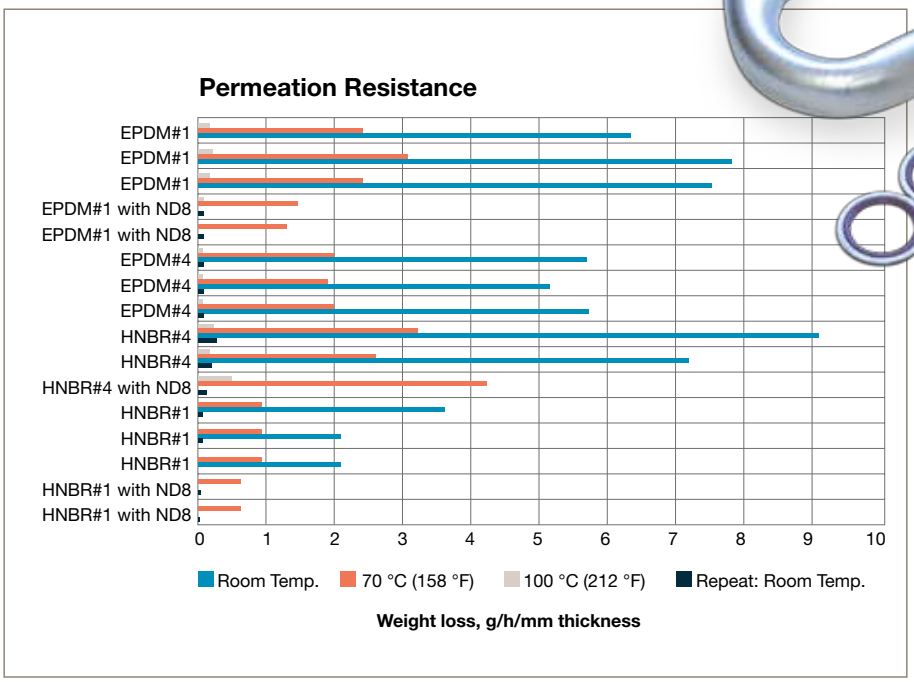
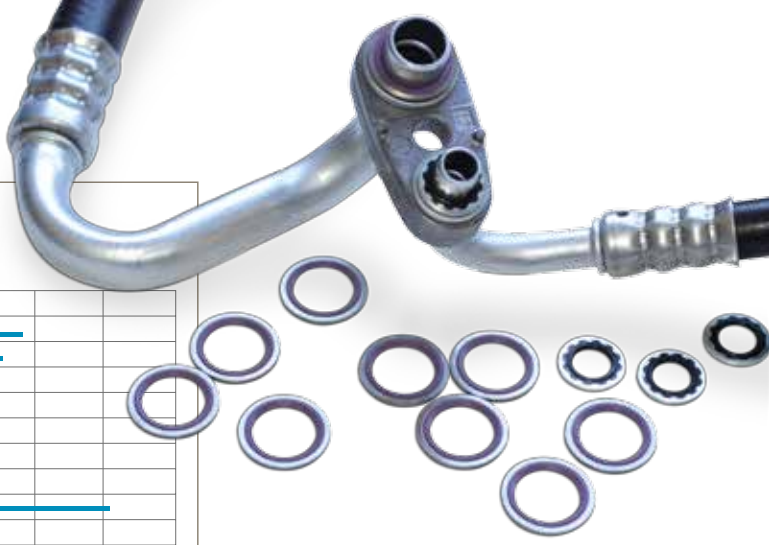


Fig. 2: Leakage rates, measured at different temperatures on thin diaphragms made of EPDM and HNBR compounds.

While the permeation performance of EPDM compounds improved with the addition of the ND-8 lubricant, more testing is required to confirm to what extent EPDM seal performance might be improved with what specific levels of lubricant.



Outlook

Apart from the current topic of converting A/C systems to the new R1234yf refrigerant A/C performance has become more critical than ever. As hybrid and battery-electric vehicles become more and more prevalent OEMs rely on these systems not only for driver comfort but also for maintaining safe operating conditions with optimal efficiency. In close collaboration with OEMs Parker is intensively working on the development of materials that meet both current and future demands. ■

Automotive refrigerants – Quo vadis?

A commentary by Tobias Haas,
Product Specialist, Business Unit Composite Sealing Systems, Packing Division Europe

Directive 2006/40/EC prescribes the use of a climate-friendly refrigerant for all new vehicle type approvals in Europe effective 1 January 2011. The Global Warming Potential (GWP) of such a refrigerant must not exceed the harmful effects on the climate of carbon dioxide by a factor of more than 150. As a result of this requirement the automotive industry had opted for R1234yf with a GWP of 335 times below that of the previously used R134A. However, the new refrigerant, not least due to its easier flammability under certain crash conditions, has ceased to be a non-controversial choice, particularly in Germany.

Although it looks as though R1234yf, which in addition to Europe is approved in the United States and Japan and is currently the only refrigerant meeting the EU's climate protection requirements, will become the global standard, alternatives are now being discussed again.

In Germany, for instance, research of CO_2 A/C systems as an option that was under consideration a few years ago, has been resumed and accelerated again. Compared with the previous R134A, CO_2 as an automotive A/C refrigerant is not harmful to the climate but, unlike R1234yf, is non-flammable. But besides its advantages, CO_2 harbours disadvantages as well, such as making particularly high demands on the pressure resistance of air-conditioning systems.

Irrespective of what system will ultimately prevail – or in the case of a conceivable "co-existence" of different systems – seals will always be a central topic, as any type of refrigerant requires effective sealing while posing specific challenges. As a seal manufacturer with many years of experience in the field of automotive A/C systems we take on these challenges by pursuing relevant research and development in close cooperation with the automotive industry. No matter in which direction the A/C journey will be heading our customers can always rely on us to accompany them on this road with materials and sealing solutions that best meet their needs.

For harsh conditions in cars

New FKM compound resistant to fuels and condensates

Today's high-performance engines make corresponding demands on the high performance of seals. With the development of the V9169-80 FKM compound Parker offers a solution which, thanks to its wide chemical resistance profile, is suitable for universal use in automotive engineering and therefore clearly reduces the number of different sealing materials required. The new, optimised compound is particularly well-suited for applications in the area of exhaust gas recirculation (EGR). Furthermore, with their improved mechanical strength seals made from FKM V9169-80 deliver an enormous reliability gain in highly loaded dynamic applications.

Andreas Fritz,
Market Unit Manager Automotive,
Packing Division Europe

V9169-80 is the first representative of a new generation of Parker FKM compounds with very good cold flexibility down to -30 °C, resistance in all commercially available fuels and against condensates (acetic acid as the reference medium). In addition, the material has been modified for ammonia compatibility. V9169-80 also exhibits very good resistance in coolants, engine oils, diesel and bio diesel. Wear resistance (abrasion according to DIN ISO 4649) compared with standard FKM compounds has been improved by 50 % and thus extends the service life of the seals.

Predestined for EGR applications

Particularly the deposition of condensates in the area of air intake systems can result in various chemical interactions with the components installed there. The consequence: gradual wear that is only manifested in the vehicle several years later. In some cases conventional seals made of standard FKM compounds lose their resilience due to chemical and physical influences. Over the long run this leads to an infiltration of undesirable substances such as acetic acid of ammonia. The abrasive chemical properties of these substances subsequently damage other movable mechanical components such as throttle valve bearings, needle bearings, movable tappets or valve pins in translatory motion.
Compared with standard FKM compounds the evolutionary Parker FKM compound V9169-80 exhibits an overall improvement of chemical resistance as a result of which it is practically predestined to fulfil the particularly high requirements in EGR systems.

More reliability for highly loaded dynamic applications

Furthermore, due to the intelligent composition of the formulation, the strength values and tensile strength have been improved to a higher level, with respect to a peroxidically cross-linked FKM compound. Tests in which material samples were deliberately damaged and subjected to cyclical deformation showed that materials optimised this way only fail in the case of clearly higher amplitudes (loads).

For highly loaded dynamic applications this means an enormous gain in reliability. Due to its improved mechanical strength, enhanced dynamic properties and outstanding compatibility with a large number of media V9169-80 is suitable for diverse applications.

Universal usability avoids risk of mix-ups

Thanks to the universal usability of the Parker V9169-80 FKM compound the number of different sealing materials used in automotive engineering can be significantly reduced. Apart from the associated advantages in warehouse logistics the risk of mixing up different sealing materials can be nearly excluded in automotive assembly operations as well as in subsequent maintenance work at garages that involve the exchange of seals. Since the use of a wrong sealing material or mix-up of seals can lead to seal failure the avoidance of this risk gives car manufacturers a substantially higher degree of certainty, as seal failure, in addition to costs incurred for repairs under warranty or even recalls, always harbours the risk of damaging the car manufacturer's image.

Environmentally harmless

In addition to the aforementioned improvements with respect to chemical resistance and mechanical strength, V9169-80 of course complies with all environmental requirements according GADSL, RoHS, WEE as well as absence of PAHs (polycyclical aromatic hydrocarbons). The measurements for all 18 PAH substances were performed by the DEKRA Laboratory for Environmental and Product Analytics in Stuttgart (Germany).
Consequently, with V9169-80 Parker offers a universally usable FKM compound that meets the most challenging demands both in terms of technology and relevant environmental requirements. ■

At a glance

- Good low- and high-temperature performance
- Very good resilience, for high-load applications
- Wear and abrasion resistance, longer service life
- Very good fuel resistance in many commercially available fuels
- Resistant to engine oil
- Resistant to acetic acid (condensate-resistant)
- No prohibited or declarable ingredients according to GADSL, SVHC, PFOS
- Conforms to RoHS, WEEE
- No detectable PAH. Measured values (measured according to ZEK 01.4-08 (GS) QMA 2001.1284) are below the detection level of 0.2 mg/kg

All-rounder for the chemical industry

Highly fluorinated FKM compound V8879-75 offers outstanding chemical resistance

Heinz-Christian Rost, Technology and Innovation Manager,
Elke Vöhringer-Klein, Market Unit Manager CPI,
O-Ring Division Europe

Excellent media resistance coupled with a robust properties profile for demanding applications in the chemical and process industry characterise Parker's innovative compound solution V8879-75. Conformity to FDA (CFR2-177.2600), REACH and the European Directive (EC) No. 1935/2004 underline the wide range of possible applications with operating temperatures from -15 to 230 °C.

The pipelines of chemical plants convey various types of media that attack the seals according to their particular aggressiveness. Among other things, the selection of the right sealing compound positively influences maintenance intervals and thus the downtimes plant and equipment, which is reflected in higher availability and lower operating costs.

The accelerated development of demanding processes in surface, painting and printing technologies in the light of consistently rising demands made on product quality calls for innovative approaches to process technology and the components used as well. The top priority here is media resistance to aggressive solvents as well as to cleaning media such as hot water or steam. This results in the requirement for high temperature resistance of the components installed, which covers low temperatures significantly below the freezing point as well as high temperatures of up to +230 °C.

Innovative HiFluor® V8879-75 compound solution

As a manufacturer of compounds and seals Parker, with a view towards the growing demands made on seals in acids, alkaline solutions, polar solvents, steam/hot water, aliphatic and aromatic hydrocarbons, has developed a sealing compound with very good mechanical properties and excellent permanent elasticity. With its excellent temperature resistance of up to 230 °C the innovative HiFluor® V8879-75 compound solution exhibits higher aging resistance than standard fluoroelastomers.

As the properties profile in Table 1 shows, HiFluor® V8879-75 is excellently suited for meeting and exceeding the demands described above.

V8879-75 exhibits a very good profile in terms of elastic performance that is supported by a solid compression set at 230 °C.
With a temperature flexibility of -2.5 °C, measured by TR10, this material solution can be used in static applications at operating temperatures down to approximately -15 °C.

Test	Standard	Dimension	V8879-75
Elastomer base			EPDM HiFluor®
Colour			Black
Hardness	DIN 53505	Shore A	80.0
Tensile strength	DIN 53504	N/mm²	21.1
Ultimate elongation	DIN 53504	%	253.0
Modulus (100 %)	DIN 53504	N/mm²	8.9
Low temperature properties TR10	ASTM D 1329	°C	-2.5
Compression set (70 h / 200 °C)	DIN ISO 815	%	36.0

Table 1: Physical data of HiFluor® V8879-75

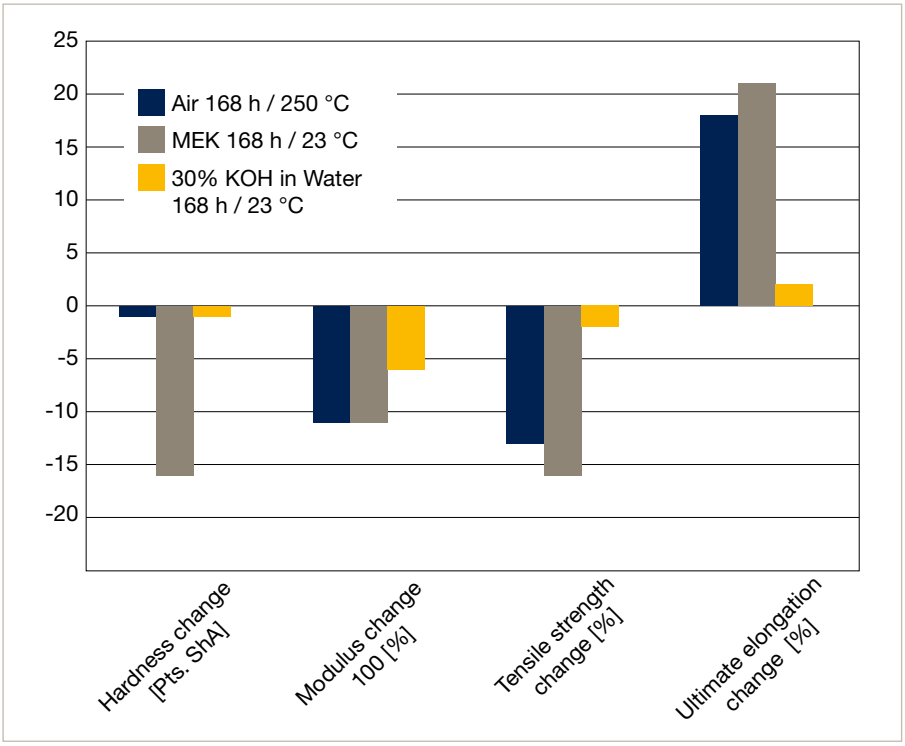


Figure 1: Typical changes following storage in air / MEK / 30% aqueous KOH solution (DuPont)

Reliable partner at high temperatures

The innovative REACH-conformant formulation of this material can cover a wide range of temperatures in the application. Figure 1 (blue) shows typical changes following storage in air after 168 hours at 250 °C (DuPont).
Both the change in modulus at 100% elongation and the changes in ultimate strength and ultimate elongation have not been rated as being significant and underline the very good temperature stability of V8879-75.

The very good temperature stability of the compound is complemented by excellent media resistance, which had been the key objective in the development of V8879-75. Solvents like MEK as well as aggressive media such as a 30 % potassium-hydroxide solution were looked at in particular. Figure 1(grey) shows the results of the material storage tests. The storage period was 168 hours at 23 °C (DuPont).

When stored in MEK, which is considered a challenging solvent in chemical and process engineering, V8879-75 exhibits very good compatibility with very moderate changes in the tested properties.

Test parameters	Limit max.	Results of global migration [mg/square inch]
Extraction in n-hexane at backflow temperature, test duration: 7 hours	175	0.39
Followed by further extraction in n-hexane at backflow temperature, test duration: 2 hours	4	0.03
Extraction in distilled water at backflow temperature, test duration: 7 hours	20	0.36
Followed by further extraction in distilled water at backflow temperature, test duration: 2 hours	1	0.29

Table 2: Global migration results

The results after storage in a 30 % potassium hydroxide solution (Figure 1, yellow) are excellent and exhibit only marginal changes to the original properties of V8879-75. The changes in hardness, elastic properties and volume have all been rated as being minimal.

Conformant to FDA CFR 177.2600 and EU Directive No. 1935/2004

In addition to achieving very good properties when developing new compound solutions for chemical and process engineering Parker always attaches great value to the materials' conformity with the legal requirements and directives in the target markets.
Particularly in processes requiring a high degree of purity of the final product the extraction stability of the assembly components is very important. V8879-75 was tested specifically for this aspect and found to be very good.
The tests evaluated global migration according to FDA CFR 177.2600 requirements. The results are summarised in Table 2.

Both the results of the initial extraction and the second extraction with n-hexane / distilled water at backflow temperature are clearly below the required maximum limits.

A multi-level solution

V8879-75 in total presents itself as a high-performance compound that delivers compelling performance with its properties profile including resistance to solvents, aggressive media and cleaning agents. Its conformity with FDA CFR 177.2600 and EU Directive No. 1935/2004 allows it to be used in a wide range of challenging applications in the chemical and pharmaceutical industries.
The REACH-conformant formulation is available as an Ultra-high-purity (UHP) version and thus usable in semiconductor technology as well. ■

40 years of partnership

A time-tested team:
Andreas Fink (Parker Sales Engineer),
Sibylle Rauber (Managing Director,
Sealing Technology),
Michael Gärtner
(Team Leader, Sealing Technology),
Silvia Wendnagel (Parker Inside Sales).

There was a reason to celebrate at Ampèrestrasse 8 in Bensheim back in January of this year. On the occasion of the company's formation by Kurt Baader 40 years ago Dichtungstechnik GmbH hosted a small celebration at the Luxor Cinema in Bensheim. The idea to start a business in the field of sealing technology was put into action in 1973. Operating strictly as a sales organisation and distributor of the Parker Seal Group (now Engineered Materials Group) Dichtungstechnik GmbH has remained loyal to its location in Bensheim for 40 years. "From there 13 employees supply seals to customers in the fields of mechanical engineering, medical technology and the chemical industry as well as power-plant operators," says Sibylle Rauber, the company's managing director. The portfolio spans the range from standard O-rings to custom products and covers an enormous breadth.

Happy faces in the management team of Dichtungstechnik GmbH:
Albert Fais (Commercial Clerk), Rosemarie Baader (wife of the company's founder),
Dirk Rödl (Team Leader), Sibylle Rauber (Managing Director),
Michael Gärtner (Team Leader).

13 November 2013 marked the 40th anniversary of the partnership with Parker as well. We extend our sincere congratulations on the company's anniversary and our appreciation for the excellent cooperation to the entire team of Dichtungstechnik GmbH. ■

Parker-Prädifa says “thank you”

Dr Manfred Achenbach has retired

He spent 28 years of his professional career in industry and an impressive 24 of them at Parker-Prädifa! Now Dr Manfred Achenbach, Parker-Prädifa’s Head of Technical and Analytical Service, has started his well-deserved retirement. Recognising his service to Parker, as well as his achievements in the field of scientific research, on this occasion and in this form is more than appropriate but cannot possibly cover the entire scope and diversity of his contributions.

That Manfred Achenbach, following an apprenticeship, A-levels and studies of mechanical engineering, added studies in physics to gain an even deeper understanding of technology, earned a PhD with a dissertation on Phase Transitions in Shape-Memory Alloys and subsequently focused his activities as an employee in the academic world on the subject of new materials suggested that he would continue to pursue a career at a scientific institute rather than one in industry. But when the environment and the task prove to be the right fit and congenial colleagues inspire one’s creativity then, as the 24 years at Parker-Prädifa prove, a job as a scientist in industry can turn out to be exactly the right choice.

But Manfred Achenbach continually contributed his extensive knowledge to academic research outside the company as well. In February, for example, he was appointed to the Research Council of the German Rubber Society (DKG) for the fourth time, to serve another term until 2016. In addition, he is well-known in professional circles as a speaker and lecturer, for instance at the International Sealing Conference of the VDMA or at the Technical Academy Esslingen, as a prolific author and as a member of various working groups dedicated to elastomers. Furthermore, over the years, numerous PhD students have been able to rely on his solid expert assistance while working on their dissertations.

Education and career

- 1971 - 1975 Student of mechanical engineering at the Integrated University Siegen
- 1975 - 1980 Student at the Technical University Berlin majoring in Engineering Physics
- 1980 - 1985 Scientific employee with focal activities in “New Materials”
- August 1986 Award of PhD in engineering (Dr.-Ing.)
- 1985 - 1987 Development engineer with MAN Technology
- 1987 - 1988 Postdoctoral work under the Leibniz programme of the DFG
- 1989 - 2013 Parker Seal Group Europe, Packing Division, Technical and Analytical Service / FEA
- Since 2008 Publicly appointed and sworn expert for rubber and plastics

Memberships

- Association of German Engineers (VDI)
- Association of Applied Mathematics and Mechanics (GAMM)
- German Rubber Society (DKG)
- Member of the Research Council of the German Rubber Society

But let us briefly return to Parker-Prädifa. When Manfred Achenbach joined the company in 1989 the objectives were clearly defined. The “art” of elastomer technology that was traditionally based on experience and “trial and error” was to be put on solid ground. One of the drivers in the company at that time was the chemist Dr Gerhard Streit. His vision was to develop mathematical models that could be used to better describe the material performance of elastomers and thus the functioning of sealing systems. In Manfred Achenbach he found exactly the right partner for this endeavour.
Together, they began to analyse factors such as the optimum degree of crosslinking to achieve the desired function, vulcanisation temperatures and heating times, for example. Even though this may initially have caused some headaches among the production and quality managers, smart product developers and application engineers soon recognised the value of this work for customers and thus made it possible for Parker-Prädifa to acquire completely new expertise as an elastomer and sealing specialist in the competitive market environment.

Apart from his great merits as an elastomer and sealing expert in the company, Manfred Achenbach was popular and valued as a person and colleague due to his friendly and unpretentious nature. Now that Dr Manfred Achenbach has ended his employment with the company, Parker-Prädifa would like to take the opportunity to wish him the very best for his well-deserved retirement and to bid farewell to a highly valued employee and colleague whose contributions will have long-lasting future effects to the benefit of Parker-Prädifa, and thus the company’s customers. ■

Parker People

On 1 December 2012 Jens Kunkel assumed the role of Market Manager Heavy Duty, Consumer und General Industry.

Kunkel joined the Parker Hannifin Sales Company in 2007 where he started as a Product Specialist in Technical Support with responsibility for Hydraulic Valves, Instrumentation Valves and Fluid Control Valves. He was instrumental in the integration of the Sales and Technical Support functions of the Fluid Connectors Division Europe in the German Sales Company.
After completion of his training and education as an industrial mechanic Kunkel was employed with various mechanical engineering companies for several years. In 2004 he was awarded state certification as a mechanical engineering technician in Offenbach am Main. Before joining Parker Kunkel worked for the Winkelmann company in Rödermark where he was responsible for hydraulic product support as well as for projects in pneumatics and joining technology.

Winfried Schröppel assumed the role of Business Unit Manager for the Business Unit Plastic of the European Packing Division on 1 April 2013.

Schröppel joined the Parker Packing Division in June 2010 as Market Unit Manager Pneumatic and during this time filed two patent applications for pneumatic seals. In March 2012 he took over the role of Location Operations Manager and holder of a general power of attorney for the Filderstadt location of the Pneumatic Division Europe (Parker Automation Group). With his new responsibility as Business Unit Manager he now returns to the Parker Engineered Materials Group.
After earning his master's degree in process engineering from the Technical University Stuttgart, Schröppel gathered initial professional experience as a Project Engineer for environmental plant and equipment engineering with Lechler GmbH.
His professional career subsequently continued as Project Leader Development in the field of linear guides with Schneeberger GmbH. From there he went on to work for Danaher GmbH, initially as Senior Engineer R&D, then as Manager R&D and subsequently as Engineering Manager and holder of a general power of attorney.
Prior to joining Parker he was Production Manager for the internationally active mechanical engineering supplier Steinmeyer in the area of high-precision drive spindles.

On 1 July 2013 Thorsten Kleinert in the role of Business Unit Manager assumed responsibility for the newly formed Business Unit CSS Europe within the Packing Division Europe.

The unit strengthens the global focus of the Composite Sealing System Division with its manufacturing plants in San Diego (California, USA), North Haven (Connecticut, USA) and Tijuana (Baja, Mexico) where static rubber-metal seals, elastic metal seals and sealing systems are produced for a wide range of markets. The new CSS team led by Thorsten Kleinert will be serving the European market of the Composite Sealing Division with local engineers.
Kleinert, who has been with Parker since 2001, earned a master's degree in mechanical engineering from the Karlsruhe University of Applied Sciences and additionally a master of engineering degree from the Wiesbaden University of Applied Sciences. While holding down his previous roles at Parker in manufacturing, application engineering and procurement he was able to acquire a wealth of knowledge that will assist him in his new role.

Gary Foston joined the Engineered Materials Group on 18 November 2013 as the Business Unit Manager for the Packing Division Europe's Gulf Coast Seal Business Unit based in Glasgow, UK.

Prior to Parker he worked in the Defence Industry as a Senior Project Manager with BAE System. He joined the Parker Filtration Group's Dominick Hunter Industrial Division Management Team in 2007 as Divisional Engineering Manager. In this role he led a large Engineering team developing innovative new products and worked on two global filtration platforms to coordinate cross division and cross region technology and engineering activities.
In 2012 he accepted an assignment in Shanghai where he successfully accelerated the localisation of Compressed Air and Gas Treatment Systems platform products to China.
In 2013 he took on the role of AP Group Engineering Manager where he has been responsible for developing project, engineering and product development processes and teams across Asia.
Gary is a Chartered Engineer and obtained a BSc (Hons) in Mechanical Engineering from the University of Northumbria.

Career at Parker

At Parker, people who are driven by the desire to shape the future, assume responsibility and put their own ideas into action have the greatest possible freedom to try out new things and to fully realise their potential. We encourage our employees to make effective use of this high level of freedom and the resulting development opportunities. To do so, we offer our employees an environment that allows and promotes individual growth. Given the multi-faceted range of topics and tasks at Parker, it is practically impossible not to find a job that is the right personal fit.

Leaders at Parker
At Parker, you will definitely not go unnoticed if you have the potential and ambition to develop into a leadership role. We offer a wealth of opportunities to make leaders fit for their responsibilities. Among others, they include our "Talent Development Process" and the "Foundations of Leadership" programme.

Specialist development at Parker
A large number of key roles at Parker are held by highly qualified employees without leadership responsibilities. These experts, who are indispensable to the company's success, find a wide range of opportunities for professional and personal advancement:

- Training programmes for professional, methodical and personal development
- Coaching by professional internal and external coaches
- Mentoring by experienced Parker employees
- A worldwide international exchange programme
- New forms of learning such as "intervision"

Corporate culture
The employees share Parker's working mentality and a polite, friendly manner. Dealings are uncomplicated and friendly and everyone is prepared to help. Dependability, fairness and honest feedback characterise the environment.

Cultural match
Those who want commitment and solidarity, without having to give up their individuality, will fit in at Parker. To feel at home with Parker, besides your expertise, you need a communicative streak and the self-confidence to ask others for help. You should also be able to adapt yourself to others – and to other cultures.

Find out more at
www.parker-karriere.de

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