nobrox® – the Allround Material for Robust Solutions in Thermoplastics

Wide Range of Applications In- and Outside Sealing Technology

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Sealing Solution to Avoid Electric Potential in Fuel Systems
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**EMG Report**

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

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Dear readers,

Welcome to our current issue of the EMG Report. Always using the right product – but what about its reliable and safe installation? Product safety and zero defects are not only increasingly important in the light of global supply chains but are on everyone’s lips primarily due to the wide range of legal challenges faced by many businesses.

In addition to laws and regulations, a wealth of increasingly specific technical standards have to be observed which, not least, are the result of technological progress and the new findings obtained as technology keeps moving forward. For many industries and companies, all this may entail a significant additional expense compared to the past. Still, we feel that this is justified, particularly when it comes to quality and product safety.

At Parker-Prädifa, we have been developing reliable quality products for you and your customers based on scientific methods and with certified and accredited laboratories for more than five decades. We are proud that our products not only meet but exceed even the most exacting demands day in day out. At the same time, we invest in the technologies that make it possible for us to meet current and future challenges in our markets.

In this issue, we invite you to read about our new material developments such as conductive FKM compounds to avoid electric potential in automotive fuel systems, long-life HNBR compounds for AdBlue® applications, and much more.

But Parker-Prädifa is a leader in the field of mistake-proofing as well. Starting on page 6, you can learn about what standards we apply and what specific processes we use in product design and development, in the manufacturing process and, specifically, in product utilization in order to come closer and closer to the zero-defects target.

Last but not least, ever since this spring, you can expect every issue of your EMG Report to provide you with information on nobrox®. The overwhelming interest our customers are showing in this material innovation confirms our conviction that we are precisely meeting the demands of the market with it. So, we look forward to a wealth of highly interesting developments together with you, our customers, in keeping with our promise:

ENGINEERING YOUR SUCCESS.

Sincerely yours,

[Signature]

Jochen Nigge
General Sales Manager EMEA
Engineered Materials Group Europe
Component reliability, long service life and economy are high on the wish list of users for obvious reasons. nobrox® enables robust sealing solutions and other engineered components that uniquely meet these wishes while potentially making less exacting demands on the surrounding components than solutions using other materials.

The new thermoplastic material is suitable for sealing, guiding and anti-extrusion elements in hydraulics and many other sealing technology applications, as well as for engineered components without a sealing function in a wide range of industrial equipment and consumer goods: from automotive engineering through to food and pharmaceuticals production. The combination of extraordinary material properties is the key to success: extreme wear resistance, broad chemical compatibility, high resilience (“snappiness”), robustness against abrasive particles, combined with cost-efficiency.

nobrox® Opens up New Possibilities

- Extensive design freedom thanks to unique combination of the material’s properties: high strength paired with elasticity, outstanding wear resistance, media resistance, permeation properties, plus excellent resilience
- Easy, robust installation
- System integration of multiple functionalities (e.g. sealing, guiding, carrier/housing element)
- Economy
- nobrox® provides an attractive alternative to PA, POM, PE, etc., depending on the application profile
- nobrox® offers exciting application and development potential.

nobrox® as an Engineering Material

Today, designers of machines, systems, functional assemblies and industrial or consumer goods of any description can choose from a tremendous range of materials to design their products. Due to its exceptional combination of properties, nobrox®, in addition to its versatile uses in sealing technology, is also superbly suited for utilization as an engineering material for all types of industrial and consumer goods. Depending on the application profile, it provides an attractive alternative to conventional materials.

It is safe to assume that nobrox® will be able to win against polyamide in many applications. Based on its outstanding permeation properties its utilization for fuel tanks in passenger cars or diaphragms in fuel systems or pressure sensors is conceivable. In addition, approvals for use in drinking water or contact with food-stuffs are currently in preparation. As a result, nobrox® will also provide an alternative to polyethylene and be suitable for engineered components in appliances such as coffee machines.

nobrox® in Sealing Technology

There are two key factors which are particularly important when sealing elements are intended for use in hydraulic applications, for example: robustness against abrasive particles that can act on the systems from the outside and high pressure and extrusion resistance. Ultimately, robustness against all kinds of stress and loads increases the reliability of the sealing systems and allows longer seal life to be achieved. The utilization of seals made of nobrox® simplifies the design of the hydraulic system as the material makes less exacting demands on the surrounding components than say PTFE compounds. As a result, larger radial gaps
behind the seal or slightly higher roughness values for the seals’ mating surfaces are possible, for example. Seals made from nobrox® stand out due to their:

- Robustness/reliability (e.g. in contact with abrasive particles)
- Long service life (excellent wear characteristics in contact with mating surfaces)
- Ease of assembly (flexibility, resilience, “snappiness,” elasticity)
- Media compatibility with hydraulic oils and resistance against moisture/hydrolysis resistance

In addition to the aforementioned properties, the various types of seals exhibit a number of other advantages:

**Slipper Seals**
- Long “mileage” thanks to application-optimized material properties

**Wipers**
- Weather resistance
- UV stability
- Resistance against dirt adhesion

**Guiding Elements**
- Compressive strength corresponding to polyamide
- No absorption of water. Swelling and resultant excessive friction are prevented (in contrast to water-absorbing polyamide), shape and dimensional stability are ensured
- Robustness/reliability (e.g. in contact with abrasive particles in earth moving equipment)

**Rotor Seals**
- Excellent sealing performance in non-pressurized conditions
- Extremely high wear resistance
- Long “mileage” thanks to application-optimized material properties
- Insensitive to pressure peaks
- Improved lubrication due to deposit of pressure medium in dynamic contact area
- Maximum extrusion resistance
- Assembly in closed and undercut housings possible

**Anti-Extrusion Rings**
- Compressive strength
- Higher strength than TPE

**Thin-Walled Diaphragms**
- Fatigue strength
- Barrier properties, high permeation density
- Thin wall thicknesses (thermoforming/embossing)

---

**Material Monograph**

- **Definition**
  Polyyketone

- **Ecology**
  - Raw material: carbon monoxide from coal combustion
  - Extended lifecycles
  - Reliable operation

- **Mechanical Properties**
  - Mechanical and thermal base values at the level of PA 6 grades
  - Low water absorption, very good dimensional stability
  - Very good hydrolysis stability
  - Extreme abrasion resistance
  - High resilience
  - Stable against oxidation attacks up to 150 °C

- **Chemical Resistance**
  - Hydrocarbons (mineral oils, gasoline)
  - Synthetic esters (HEES)
  - Aldehydes
  - Water, weak acids (vinegar) and weak bases (ammonia)

- **Barrier Properties**
  - Oxygen permeation rate smaller than PA 6 by a factor of 4, smaller than POM by a factor of 8
  - Gasoline permeation (GM Spec 9061-P) lower than PTFE and PA 12

- **Approvals**
  Food and drinking water approvals in preparation

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For additional info, go to www.parker.com/nobrox
Focus on Product Safety
The safety of a product is its key quality feature. Defective products lead to high consequential costs, may entail product recalls, and in most cases damage the manufacturer’s image as well. Industry uses a vast array of methods to avoid all this. Part 1 of this article on product safety takes a general look at this topic and specifically describes how Parker-Prädifa as a seal manufacturer contributes to the safety of its customers’ products in various ways.

The reliability of the manufacturing process and subsequent functional safety are the key elements that describe the quality of a product today. Defective components, component assemblies, and other deficiencies typically lead to high consequential costs and a considerable investment of time in both the suppliers and customers’ operations. In addition, rework requirements can significantly interfere with the flow of a value chain within the manufacturing process. If a defective component actually reaches the final user or consumer, the total costs and number of parties involved increases even further, plus it harbors the risk of damaging the manufacturer’s image.

"Zero Defects" as a Requirement and Target

Companies in practically all industries make major efforts to counteract such adverse events. The so-called “zero defects” requirement, for instance, is included in numerous functional or very detailed product specifications. Specialized teams and targeted methods are used in cross-industry efforts to prevent defects. In industrial companies, methods such as PDCA (Plan Do Check Act) or Six Sigma have been gaining increasing importance. The success of companies that use these methods to continue to develop and grow their business obviously justifies the related additional investment of manpower and time. As a matter of fact, there seems to be no alternative to continuous development and improvement in an industrial company when it comes to sustainably securing its future. This is even true in the event that in the course of such processes actions are taken that may subsequently prove ineffective or even appear a bit strange, as fittingly expressed in a quote by the famous natural scientist Georg Christoph Lichtenberg:

“I cannot say whether things will get better if we change; what I can say is that they must change if they are to get better.”
Poka-yoke – The Art of Avoiding Mistakes by Simple Means

Poka-yoke has its origin in Japanese and – roughly translated – means “to avoid mistakes.” This mistake avoidance mechanism was formalized by the Japanese engineer and quality expert Shigeo Shingo and consists of several elements. Central to poka-yoke is the utilization of systems that are equally simple, cost-efficient and effective and which ensure that mistakes in the manufacturing process do not result in defects on the final product or even lead to failure and hazards in the application. Examples include acetylene bottles being provided with a special clamp connection to prevent a hazardous mix-up with other gases. SIM cards have a special shape ensuring that the cards can only be inserted into cell phone card slots in the correct orientation. USB or TAE (landline telephone) plugs cannot be inserted “the wrong way around” either. Similar to these examples, Parker-Prädifa follows the poka-yoke philosophy to come up with simple solutions such as those on the geometry of the sealing element or providing seals with different colors, as described in this article, in order to ensure that mix-ups are practically excluded.

Preventing Defects as Early as in Product Design

To avoid defects as early as in product design, development departments often perform a DFMEA (Design Failure Mode and Effects Analysis). The possible failures and defects listed in a DFMEA and their assessment in terms of effects and detection can reach a considerable scope even in the case of small machine elements. Up to 800 “preventive actions” are not uncommon in a design FMEA for sealing elements. Aggregated in a user component assembly or a machine, this implies an enormous effort. At the same time, this commitment cultivates a constant awareness of the need to detect and exclude possible defects and failures at an early stage.

In-Process Minimization of Failure Modes

Typically, DFMEAs are seamlessly followed by analyses performed by the manufacturing departments, referred to as PFMEA (Process Failure Mode and Effects Analysis). Assembly processes should ideally be minimized to the extent possible. However, human errors and system-related faults cannot be generally excluded. The poka-yoke mechanism that is widely used in industry describes how, in the best case, unintentional mistakes can be avoided. As a result, typically simple yet effective systems can prevent in-process errors leading to defects in the final product.

Avoiding Mix-ups of Seals in the Application

In terms of value, the products of the sealing industry are often classified as C-parts on the sourcing side of the house. However, with respect to the functionality of the assembly or machine in which they are installed, these products absolutely represent “A-value.” This is the basis for the high quality standards to be met by sealing products. Provided that the quality of the seal has been ensured by the manufacturer in the first place, it is important to add further reliability and safety to the assembly process. This may be achieved, for example, by a clever poka-yoke solution on the geometry of the sealing element. Additionally, the color of the element may help the installer or machine operator select the right seal.

Furthermore, commercial elastomers and the seals made from them may require prior confirmation of their chemical compatibility with the operating fluid, as rubber elastomers may exhibit a great diversity of chemical reactions with the relevant operating medium. The fact that both suitable and totally unsuitable rubber elastomers have the same color – typically black – may pose a problem to the user. The thermal suitability of the sealing compound is a similar issue. Therefore, the ability to make a clear distinction between “suitable and unsuitable” due to unique coloring may be of major importance to the user. Sealing elements made from thermoplastic elastomers are relatively easy to color in the manufacturing process. Parker-Prädifa, for instance, utilizes about 25 different polyurethane grades, each of which has a color that is unique to it.

However, in the case of rubber elastomers, the sealing industry has been facing a much greater challenge in this respect. The reason is a group of main fillers used for these elastomers, i.e. carbon black. Their specific black color has spread to most commercial elastomers. It is nearly impossible to mask these carbon blacks by another color. In the past, only some FKM grades could be distinguished from other rubber elastomers by their green coloring. The new HNBR type “N9192” (see article “Unmistakable and Universal on p. 11) recently developed by Parker-Prädifa is distinguished by its gray color and can thus clearly enhance process reliability and user friendliness.
For obvious reasons, product safety is increasingly subject to legal provisions. As the industry’s first manufacturer to do so, Parker-Prädifa is now implementing the requirements of the German Product Safety Act, which is based on EU law, for seals and other polymer products, thus playing a pioneering role.

New Product Labels for more Safety
Implementation of the Product Safety Act for Parker-Prädifa
Seals and Polymer Products

According to the Product Safety Act (ProdSG), which has been in effect in Germany since the end of 2011, manufacturers have to provide their products with appropriate user instructions if, for the protection of health and safety, specific requirements (such as warnings) have to be complied with during usage, maintenance and repair of the products. For products sold in Germany, these instructions must be available in the German language and visible to the end user on the product.

Two “Tricky” Challenges
For Parker-Prädifa, these legal requirements entail two tricky challenges. As our products, for one, are sold around the world, this raises the question about the appropriate language to be used. For the other, the size of our products does not provide a sufficiently large surface for such information. Added to this is the demand that the instructions must be visibly available to the user of the products. Hence a reference to a website printed on the packaging label is not an option. A case in point would be the repair of an agricultural machine in the middle of a forest where it can be assumed that the user has no internet access.
Principles of Proportionality May Be Applied

Fortunately, the ProdSG also contains references to “Application of the Principles of Proportionality.” For instance, Section 6, Item 3 of the Act says “…exceptions from the obligations … are permissible if and when the omission of the information is acceptable, in particular if the information is already known to the user or if its application [to the product] would involve an unreasonable effort.” However, in view of the responsibility which sealing technology products have in the context of the functional safety of machines and equipment in the end user’s operations, Parker-Prädifa felt that, in any event, it was appropriate to come up with a meaningful solution for compliance with the law.

Practical Solution Developed Internally

Even though to date the relevant national organizations and bodies have not reached any agreement on how to precisely implement the Act with regard to seals, an internal team has now developed an effective and feasible solution for Parker-Prädifa’s products. To satisfy the requirement of providing information in the relevant languages, the team selected appropriate pictograms with pictorial pointers regarding misuse or mishandling. The pictograms (largely according to DIN ISO 7000) refer to the typical criteria for suitability in the application and the required appropriate storage. In the interest of our end customers and in line with our obligations under applicable law, a responsible and practical solution has thus been found.

The following pictograms will be found on all product labels of the Parker Engineered Materials Group, starting in January 2016:
In N9192-80, Parker-Prädifa is offering a new universally usable HNBR compound for challenging demands. The material that is particularly suitable for automotive applications is characterized by good cold flexibility down to -35 °C and resistance against commonly used hydraulic media, specifically in automobiles. In addition, N9192-80 exhibits very good resistance to coolants and engine oils. Wear resistance has been improved by 30% compared to standard HNBR compounds.

HNBR polymers are produced by hydrogenation of NBR, which results in higher temperature resistance and better protection against oxidative attacks. Compared with conventional HNBRs, the new N9192 compound was improved once more by skillful selection of the raw materials and formulation. Thanks to its gray color, the risk of confusing various seals or sealing materials with black seals (e.g., based on EPDM, FKM, AEM and ACM) in automobiles can be excluded. As mix-ups harbor the risk of seal failure in important technical components that may result in high costs up to and including recalls and the associated risk of major image loss to the manufacturer, this is a significant gain in reliability and safety (see also article “Product Safety, Avoiding Defects on Sealing Technology Products”, p. 7).

**Enormous Gain in Reliability**

Modern high-performance engines require seals and sealing systems that deliver top performance in terms of operating reliability and service life as well. The new N9192-80 compound meets the necessary prerequisites in these applications in an outstanding manner. Due to intelligent formulation of the peroxidically linked HNBR compound, the seal’s strength values, abrasion performance and restoring rate could be improved to yet another higher level. For high-load dynamic applications, this means an enormous gain in reliability.

**Excellent Resistance**

Due to its optimized mechanical strength, improved dynamic properties and outstanding compatibility with a wide range of media, N9192-80 is suitable for diverse applications. N9192 is resistant against mineral oil-based hydraulic fluids and fully synthetic transmission fluids. Its improved dynamic properties qualify the compound for reliable utilization in challenging hydraulic applications. Additional fields of application for N9192 are opening up in refrigeration engineering and in the coolant circuit as the compound has very good resistance in coolants. Furthermore, N9192 is suitable for use as a sealing material in diesel exhaust gas technology as the com-
pound exhibits no significant changes in mechanical properties, particularly volume swelling, in 32.5 % urea solutions (AdBlue®). The aqueous urea solution is used in the catalytic reduction of environmentally toxic hydrogen oxides that are produced in the combustion process of diesel engines.

**Health and Environment**

N9192 is a new high-performance compound that additionally satisfies two further requirements in terms of health and environmental protection. Naturally, the compound complies with legal requirements (REACH, SVHC, RoHS, etc.). In addition, N9192 is free from polycyclic, aromatic hydrocarbons (PAHs) which have been proven to be carcinogenic as well as having a major adverse effect on the environment. Measurements obtained according to ZEK 01.4-08 (GS) QMA 2001.1284 are below the limit of quantitation (LOQ) of 0.2 mg/kg, as confirmed by the DEKRA Laboratory for Environmental and Product Analytics in Stuttgart.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Unit</th>
<th>N3510-85</th>
<th>N9192-80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastomer base</td>
<td></td>
<td></td>
<td>HNBR</td>
<td>HNBR</td>
</tr>
<tr>
<td>Color</td>
<td></td>
<td></td>
<td>Standard</td>
<td>New</td>
</tr>
<tr>
<td><strong>Physical Data</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shore A hardness</td>
<td>DIN ISO 7619-1</td>
<td>Points</td>
<td>85±5</td>
<td>80±5</td>
</tr>
<tr>
<td>Density</td>
<td>DIN EN ISO 1183-1</td>
<td>g/cm³</td>
<td>1,22</td>
<td>1,24</td>
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<tr>
<td>Tensile strength</td>
<td>DIN 53504</td>
<td>MPa</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Ultimate elongation</td>
<td>DIN 53504</td>
<td>%</td>
<td>166</td>
<td>219</td>
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<tr>
<td>Tear propagation strength</td>
<td>ISO 34-1/B/b</td>
<td>N/mm</td>
<td>16</td>
<td>10</td>
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<tr>
<td>Compression Set 24hrs/150°C</td>
<td>DIN ISO 815/7.5.2/A</td>
<td>%</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td>Compression Set 24hrs/125°C</td>
<td>DIN ISO 815/7.5.2/B</td>
<td>%</td>
<td>53 1)</td>
<td>43 1)</td>
</tr>
<tr>
<td>Abrasion</td>
<td>ISO 4649:2014-03</td>
<td>mm³</td>
<td>219</td>
<td>151</td>
</tr>
<tr>
<td>Ozone resistance</td>
<td></td>
<td>Crack level 0 (no cracks)</td>
<td>0 0</td>
<td></td>
</tr>
<tr>
<td><strong>Cold Properties</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tg / Glass transition temperature</td>
<td>DSC / Midpoint</td>
<td>°C</td>
<td>-23</td>
<td>-36</td>
</tr>
<tr>
<td><strong>Ageing in Air 168hrs / 150 °C</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shore A hardness change</td>
<td>DIN 53508</td>
<td>Points</td>
<td>+8</td>
<td>+5</td>
</tr>
<tr>
<td>Tensile strength change</td>
<td>DIN 53508</td>
<td>%</td>
<td>-9</td>
<td>-9</td>
</tr>
<tr>
<td>Tear propagation strength change</td>
<td>DIN 53508</td>
<td>%</td>
<td>-51</td>
<td>-14</td>
</tr>
<tr>
<td><strong>IRM-901 / IRM-902 / IRM-903 (Standard Test Oils Based on Mineral Oils)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volume change</td>
<td>DIN ISO 1817</td>
<td>%</td>
<td>-1</td>
<td>-6</td>
</tr>
<tr>
<td>Volume change</td>
<td>DIN ISO 1817</td>
<td>%</td>
<td>+7</td>
<td>+4</td>
</tr>
<tr>
<td>Volume change</td>
<td>DIN ISO 1817</td>
<td>%</td>
<td>+14</td>
<td>+14</td>
</tr>
</tbody>
</table>

1) Cooled down to room temperature for 2 hours in the mold in clamped condition.
Automotive fuel systems harbor the risk of electrostatic charging which may lead to arcing. The objective, therefore, is to engineer fuel systems using conductive components. Parker-Prädifa effectively supports this aim in a new generation of FKM sealing compounds delivering significantly increased conductivity combined with excellent media resistance. Compared with standard FKM materials for fuel applications, the new Parker compound V8918-75 improves conductivity by a factor of 1,100,000 on the component (O-ring).
Electric charging of fuel systems has been subject to intensive research for quite some time. The research results of this complex issue have been summarized in the SAE J1645 (200110) standard. In-depth investigations conducted as part of this research work have shown that the flow of fuel may result in electrostatic charging of the fuel systems. To minimize this issue – and avoid the related risk of arcing – the objective is to engineer automotive fuel systems using conductive components, or to make them electrically conductive.

Conductivity of Sealing Systems Plays a Significant Role

The electrical conductivity of sealing systems plays a significant role in this context as well. As the FKM elastomers used in these applications are very good insulators per se, the utilization of standard elastomers would result in an electrical isolation of the fuel system components. Therefore, Parker-Prädifa developed a new generation of FKM sealing compounds with significantly increased conductivity combined with excellent media resistance. Standard FKM compounds for fuel applications have a conductivity of $2.1 \times 10^{11}$, whereas the conductivity of Parker’s new FKM compound V8918 is $1.83 \times 10^4$, equating to an improvement by a factor of 1,100,000.

New Development with Challenging Requirements Profile

The development of the new FKM compound generation involved a number of criteria to be observed. The physical properties of the FKM had to be on a high level, electrical conductivity was to be significantly increased, media resistance to fuel, biofuels and flexfuels had to be exceptionally good, and cold flexibility had to be ensured. Table 1 summarizes the properties profile of the newly developed compound V8918.

Table 1: Properties profile of the new V8918 FKM compound

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Dimension</th>
<th>V8918-75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastomer base</td>
<td>FKM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardness</td>
<td>DIN 53505</td>
<td>Shore A</td>
<td>78</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>DIN 53504</td>
<td>N/mm²</td>
<td>20.9</td>
</tr>
<tr>
<td>Ultimate elongation</td>
<td>DIN 53504</td>
<td>%</td>
<td>184</td>
</tr>
<tr>
<td>Compression set (94 hrs / 150 °C)</td>
<td>VW PV3330</td>
<td>%</td>
<td>43</td>
</tr>
</tbody>
</table>

Table 2: Conductivity comparison between V8918 and standard FKMs with bright and dark fillers for fuel systems on the component (O-ring 7.10x1.84)

<table>
<thead>
<tr>
<th>Property</th>
<th>Dimension</th>
<th>V8792-75</th>
<th>V3642-75</th>
<th>V8918-75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastomer base</td>
<td>FKM</td>
<td>FKM</td>
<td>FKM</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>Black</td>
<td>Black</td>
<td>Black</td>
<td></td>
</tr>
<tr>
<td>Conductivity (O-ring 7.10 x 1.84)</td>
<td>Ω</td>
<td>4.11E+11</td>
<td>2.1E+11</td>
<td>1.83E+4</td>
</tr>
</tbody>
</table>

Table 3: Storage profile including re-drying of V8918-75 in FAM B and E85 (re-drying: 22 hrs at 85 °C) acc. to VW 2.8.1 A

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Dimension</th>
<th>FAM B (168 hrs / 23 °C)</th>
<th>E85 (168 hrs / 23 °C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness in original condition</td>
<td>IRHD</td>
<td>77</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>Hardness after storage</td>
<td>Pts. IRHD</td>
<td>-14</td>
<td>-6</td>
<td></td>
</tr>
<tr>
<td>Hardness after re-drying</td>
<td>Pts. IRHD</td>
<td>75</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td>Tensile strength in original condition</td>
<td>N/mm²</td>
<td>17.8</td>
<td>17.8</td>
<td></td>
</tr>
<tr>
<td>Tensile strength after storage</td>
<td>N/mm²</td>
<td>10.3</td>
<td>15.7</td>
<td></td>
</tr>
<tr>
<td>Tensile strength after re-drying</td>
<td>N/mm²</td>
<td>17.2</td>
<td>17.9</td>
<td></td>
</tr>
<tr>
<td>Ultimate elongation in original condition</td>
<td>%</td>
<td>205</td>
<td>205</td>
<td></td>
</tr>
<tr>
<td>Ultimate elongation after storage</td>
<td>%</td>
<td>198</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td>Ultimate elongation after re-drying</td>
<td>%</td>
<td>215</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td>Weight change after storage</td>
<td>%</td>
<td>8.5</td>
<td>1.6</td>
<td></td>
</tr>
</tbody>
</table>
filled with carbon black, electrical conductivity slightly improves to 2.1E+11 in the case of V3642, for example.

The utilization of advanced modification techniques made it possible to develop compounds with increased conductivity. In the case of V8918, conductivity is 1.83E+4, equating to a 1,100,000-fold improvement compared with the standard V3642.

Table 2 summarizes the results of the comparison. All results were obtained on the component (O-ring: 7.10x1.84).

**New Generation Combines Conductivity with Media Resistance**

In addition to significantly enhanced conductivity, the utilization of a material in modern fuel systems requires excellent media resistance. Table 3 reflects the storage results of V8918 in FAM B and E85. The storage tests were conducted according to VW 2.8.1 A at 23 °C for 168 hours. After re-drying the samples at 85 °C for 22 hours, only a marginal change of the original properties can be observed in both test media.

Furthermore, the fuel storage tests shown above were supplemented by investigations in fuel mixtures based on diesel / biodiesel according to VW 2.8.1 T. Table 4 summarizes the results obtained. The long-term tests performed again show very good resistance of V8918-75.

**Flexibility Also Ensured in Cold Conditions**

To test the flexibility of the newly developed V8918-75 compound in realistic conditions, a bending test according to VW 2.8.1 was performed both with and without relevant pre-storage of the samples in B20 SME at 125 °C for 168 hours and in B20 FAM B at 60 °C for 168 hours. Table 5 shows the results. V8918-75 successfully passed all the bending tests. Accordingly, this material is very well suited for low application temperatures too.

**A Material for Four Requirements Profiles**

The new Parker-Prädifa compound V8918-75 exhibits a well-balanced physical profile, significantly increased electrical conductivity, very good media resistance, as well as very good suitability for low application temperatures. Consequently, it is predestined for sealing solutions to minimize electrical charging in fuel systems.

<table>
<thead>
<tr>
<th>Property</th>
<th>Dimension</th>
<th>B20 SME (504 hrs / 125 °C)</th>
<th>SME (504 hrs / 125 °C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness in original condition</td>
<td>IRHD</td>
<td>77</td>
<td>77</td>
</tr>
<tr>
<td>Hardness after storage</td>
<td>Pts. IRHD</td>
<td>-9</td>
<td>-10</td>
</tr>
<tr>
<td>Hardness after re-drying</td>
<td>Pts. IRHD</td>
<td>6</td>
<td>-6</td>
</tr>
<tr>
<td>Tensile strength in original condition</td>
<td>N/mm²</td>
<td>17.8</td>
<td>17.8</td>
</tr>
<tr>
<td>Tensile strength after storage</td>
<td>N/mm²</td>
<td>10.2</td>
<td>13.9</td>
</tr>
<tr>
<td>Tensile strength after re-drying</td>
<td>N/mm²</td>
<td>9.5</td>
<td>14.1</td>
</tr>
<tr>
<td>Ultimate elongation in original condition</td>
<td>%</td>
<td>205</td>
<td>205</td>
</tr>
<tr>
<td>Ultimate elongation after storage</td>
<td>%</td>
<td>147</td>
<td>194</td>
</tr>
<tr>
<td>Ultimate elongation after re-drying</td>
<td>%</td>
<td>132</td>
<td>186</td>
</tr>
<tr>
<td>Weight change after storage</td>
<td>%</td>
<td>19.8</td>
<td>6.5</td>
</tr>
<tr>
<td>Weight change after re-drying</td>
<td>%</td>
<td>11.2</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Table 4: Storage profile including re-drying of V8918-75 in B20 SME (80% diesel + 20% SME) and SME (re-drying: 22 hrs at 85 °C) acc. to VW 2.8.1. T

<table>
<thead>
<tr>
<th>Bending Test acc. to VW 2.8.1</th>
<th>Without Medium</th>
<th>B20 SME (168 hrs / 125 °C)</th>
<th>B20 FAM B (168 hrs / 60 °C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-25 °C</td>
<td>okay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-30 °C</td>
<td>okay</td>
<td>okay</td>
<td></td>
</tr>
<tr>
<td>-35 °C</td>
<td>okay</td>
<td>okay</td>
<td>okay</td>
</tr>
<tr>
<td>-40 °C</td>
<td>okay</td>
<td>okay</td>
<td>okay</td>
</tr>
<tr>
<td>-45 °C</td>
<td>okay</td>
<td>okay</td>
<td>okay</td>
</tr>
</tbody>
</table>

Table 5: Bending test of V8918-75 after respective pre-storage in B20 SME (80% diesel + 20% SME) and B20 FAM B (80% diesel + 20% FAM B) acc. to VW 2.8.1
Long Life of Seals in AdBlue® Applications

New Compound Generation Marks the Next Step

In the heavy-duty segment of the transportation industry, particularly in the truck business, longer service life of the components used, including seals, is becoming increasingly important. This trend is reflected in both extended maintenance intervals and elevated requirements for the sealing compounds used. Parker has developed two new HNBR compounds to meet these higher demands. A significant optimization of compression set combined with retention of the core properties such as low-temperature flexibility was the key development objective.
New Benchmark for Long-Life Capability

Challenging sealing tasks such as those encountered in high-temperature AdBlue® (AUS 32) applications require extremely long life of the sealing systems used. Long life is combined with very good short-term and long-term compression set. Parker has developed a new generation of HNBR compounds for these applications. They are characterized by a significant improvement of the compression stress relaxation (CSR) values, as well as the compression set (CS) values, at high temperatures of 150 °C. Especially in the case of thin test samples (and thus thin cross sections), a relative improvement of compression set by more than 50 % can be achieved in comparison with a standard HNBR type in a 168-hour test. Long-term tests confirm the significant improvement of CSR capability by more than 40 %, setting a new benchmark for long-life capability.

Table 1 summarizes the original values of the developed compounds compared with a standard type.

E1 (experimental designation during the commercialization stage) and N8994-75 (production designation) are new-generation HNBR grades with black and bright fillers, respectively. N3573-75 is a proven reference in the field of heavy-duty applications.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Dimension</th>
<th>E1</th>
<th>N8994-75</th>
<th>N3573-75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastomer base</td>
<td></td>
<td></td>
<td>HNBR</td>
<td>HNBR</td>
<td>HNBR</td>
</tr>
<tr>
<td>Color</td>
<td></td>
<td></td>
<td>black</td>
<td>red</td>
<td>black</td>
</tr>
<tr>
<td>Hardness</td>
<td>DIN 53505</td>
<td>Shore A</td>
<td>75</td>
<td>75</td>
<td>79</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>DIN 53504</td>
<td>N/mm²</td>
<td>17</td>
<td>21.2</td>
<td>27.2</td>
</tr>
<tr>
<td>Modulus (100 %)</td>
<td>DIN 53504</td>
<td>N/mm²</td>
<td>11.2</td>
<td>9.2</td>
<td>7.0</td>
</tr>
<tr>
<td>Ultimate elongation</td>
<td>DIN 53504</td>
<td>%</td>
<td>161</td>
<td>164</td>
<td>274</td>
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<tr>
<td>TR10</td>
<td>ASTM D 1329</td>
<td>°C</td>
<td>-18</td>
<td>-18</td>
<td>-18</td>
</tr>
</tbody>
</table>

Table 1: Original values of the compounds named above

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Dimension</th>
<th>E1</th>
<th>N8994-75</th>
<th>N3573-75</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 70 hrs / 150 °C (13x6 mm specimen)</td>
<td>ISO 815 a</td>
<td>%</td>
<td>14</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>CS 70 hrs / 150 °C (13x2 mm specimen)</td>
<td>ISO 815 a</td>
<td>%</td>
<td>15</td>
<td>15</td>
<td>27</td>
</tr>
<tr>
<td>CS 70 hrs / 150 °C (13x6 mm specimen)</td>
<td>ISO 815 a</td>
<td>%</td>
<td>20</td>
<td>22</td>
<td>34</td>
</tr>
<tr>
<td>CS 70 hrs / 150 °C (13x2 mm specimen)</td>
<td>ISO 815 a</td>
<td>%</td>
<td>18</td>
<td>19</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 2: Overview of compression set values depending on test duration and height of the specimen

Significant Performance Improvements

The two newly developed compounds, E1 and N8994-75, have been optimized particularly with respect to compression set. Both, test specimen with a thickness of 6 mm (representative for thick cross sections) and test specimen with a thickness of 2 mm (representative for thin cross sections), were examined. The results are presented in Table 2. The tests were performed at 150 °C for 70 hours and 168 hours, respectively.

A significant improvement of compression set was achieved. The performance of the new materials is particularly notable in the case of thin samples and thus thin cross sections.

Permanently Capable

The significant improvement of short-term properties is complemented by clear improvement of the long-term properties. Figure 1 shows a roundup of compression stress relaxation results measured for a period of up to 1,008 hours at 150 °C. As attention was focused on thin cross sections in this case as well, 13 x 2 mm specimen were tested.
### Table 3: Storage profile of E1 and N8994-75 after storage in AdBlue® (aqueous urea solution with 32.5% urea) for 168 hours at 120 °C

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Dimension</th>
<th>E1</th>
<th>N8994-75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in hardness</td>
<td>DIN 53505</td>
<td>Pts. Shore A</td>
<td>-5</td>
<td>-3</td>
</tr>
<tr>
<td>Change in tensile strength</td>
<td>DIN 53504</td>
<td>%</td>
<td>-6</td>
<td>-2</td>
</tr>
<tr>
<td>Change in ult. elongation</td>
<td>DIN 53504</td>
<td>%</td>
<td>-1</td>
<td>3</td>
</tr>
<tr>
<td>Change in modulus (100%)</td>
<td>DIN 53504</td>
<td>%</td>
<td>-12</td>
<td>0</td>
</tr>
<tr>
<td>Change in weight</td>
<td>DIN ISO 817</td>
<td>%</td>
<td>13.5</td>
<td>8.7</td>
</tr>
<tr>
<td>Change in volume</td>
<td>DIN ISO 817</td>
<td>%</td>
<td>12.9</td>
<td>8.3</td>
</tr>
<tr>
<td>CS in medium</td>
<td>ISO 815 a</td>
<td>%</td>
<td>6.3</td>
<td>7.2</td>
</tr>
</tbody>
</table>

**At Home in Aggressive Media**

The very good CS/CSR values are complemented by well-balanced media resistance in aggressive media. Storage in AdBlue® at temperatures above 120 °C poses great challenges to many materials as the urea contained in AdBlue® decomposes, causing a release of ammonia and resulting in very high volume swelling and a significant drop in mechanical properties.

The very good resistance of E1 and N8994-75 in this media environment is presented in Table 3. Both compounds exhibit no influence by the ambient conditions. Volume change and weight change values are not conspicuous either. Compression set in the medium is very good as well.

**Combination of Long Life and Resistance**

The newly developed Parker compounds for the heavy-duty market exhibit a clear improvement in CS/CSR values, both in short-term and long-term observation. The significant improvement of performance is particularly noteworthy in the case of thin specimen (thin cross sections). Very good resistance in challenging media at high temperatures rounds out the well-balanced profile of this new HNBR compound generation.
Otto Glas Handels-GmbH is New Parker-Prädifa Distributor

Customers of the Specialized Bavarian Wholesaler Have Been Able to Buy Products from Parker-Prädifa since April

The cooperation was signed and sealed in a ceremony at the Hanover Industry Fair in April. As a result of the agreement, Otto Glas Handels-GmbH based in Eggenfelden, Bavaria, has become an official Parker-Prädifa distributor for southern Bavaria.

Otto Glas Handels-GmbH was founded in 1955 and has 210 employees. In addition to its headquarters in Eggenfelden, the company has six other locations in Bavaria and Austria. As a specialized wholesaler, Glas supplies technical components to some 8,000 regional customers, defining its mission as that of a full-range trader and solutions provider. In addition to premium product quality, Glas is focused on providing expert consulting support, delivered in close cooperation with innovative manufacturers such as Parker.

A fleet of about 80 delivery vehicles ensures daily supply to customers and the company’s own branches. Due to its close proximity to customer sites, the specialized wholesaler can respond quickly and flexibly to client requirements. On-demand finishing of hydraulic, pneumatic or specialty hoses in volume production according to customer specifications or based on samples by appropriately certified employees are further strengths of the company. Optimization of procurement processes by C-Part or Kitting based on customer wishes are part of the company’s service portfolio as well. Prior to sealing the partnership with Parker-Prädifa, Otto Glas Handels-GmbH had been successfully working together with other Parker divisions since 1988.

“With its high professional expertise, Otto Glas Handels-GmbH precisely matches the demands we make on ourselves at Parker,” says General Sales Manager Jochen Nigge. “We are pleased to welcome Glas as another company to our line-up of strong sales partners and look forward to our successful cooperation for the benefit of the customers we both serve.”

www.go-glas.de

Signing of the agreement at the 2015 Hanover Fair
Pictured from left to right: Jochen Nigge (General Sales Manager, Parker-Prädifa), Philippe Halloin (Vice President of Operations, PP), Peter Glas (CEO, Glas), Bernd Wemmer (Sales Manager Central Europe, PP), Elke Vöhringer-Klein (Market Unit Manager, PP), Thomas Ottawa (General Manager, PP)
Odorization, i.e. the addition of odorants as a warning signal for leaks and equipment defects, is an important, primary safety precaution taken by gas system operators. While in the past sulfurous substances were typically used for this purpose, operators today are increasingly opting for a more eco-friendly non-sulfurous odorant called Gasodor® S-Free.

Parker meets the resulting higher requirements for sealing technology with optimal sealing materials such as the Parofluor® (FFKM) compound V8910-75.
Odorants are added to otherwise odorless gases such as natural gas, oxygen, methane, nitrogen, etc. in odorizing systems as a warning odor so that the gas consumer can quickly smell leaks and defective equipment, and take specific corrective actions. Therefore, odorization, i.e. the addition of odorants, is an important and indispensable safety precaution taken by system or grid operators. Normally, volatile organic sulfur compounds such as tetrahydrothiophene (THT) with a smell that is similar to rotten eggs are used for this purpose. As it is possible today to decrease sulfur content in view of environmental and technical concerns, a non-sulfurous odorant with the trade name of Gasodor® S-Free is increasingly utilized as an odorant.

**Absence of Sulfur Makes Increased Demands on Sealing Materials**

As the composition and thus the properties of Gasodor® S-Free significantly differ from those of tetrahydrothiophene (THT), its utilization usually requires conversions of the odorizing systems. Particularly in sealing applications, individual elastomer compounds exhibit heavy swelling in the saturated steam and liquid phase. Due to the higher requirements for sealing technology, Parker has qualified optimum compounds for natural gas applications. In contact with liquid Gasodor® S-Free, Parker recommends sealing elements made of the Parofluor® (FFKM) compound V8910-75. This material is based on state-of-the-art polymer technology and characterized by outstanding chemical resistance. Parofluor® V8910-75 sealing elements have been tested based on DVGW requirements according to DIN EN 549:1994 for media resistance and exhibit outstanding results. Therefore, they can be utilized in odorizing systems, in process and metering pumps, in valves and vessels, and in measuring and control technology with Gasodor® S-Free without any problem.

**Impressive Chemical Resistance**

Low volume swelling of the elastomer is a prerequisite for flawless functionality of the sealing elements in Gasodor® S-free systems, metering pumps, valves and tanks, and in measuring technology. The test results mentioned above were obtained in laboratory tests and confirm minimal volume swelling of the V8910-75 compound. Consequently, Parofluor® V8910-75 featuring state-of-the-art polymer technology and outstanding chemical resistance qualifies as the material of choice for any application involving the utilization of odorants.
EMI Shielding Gaskets for all Occasions
Advanced Solution Delivers High Performance in any Environment

Common application criteria for industrial EMI shielding gaskets are wide and varied, but can rarely, if ever, be met by a single solution. The latest generation of advanced nickel-plated, aluminum-filled (Ni/Al) silicone elastomer EMI shielding gaskets developed by Parker Chomerics now suits all of the market’s key application requirements.

Examining the market requirements for EMI shielding gaskets leads to one overriding conclusion: there is huge demand for gaskets that can fulfil not just some but all of industry’s common application criteria. For instance, in modern applications, high EMI shielding performance needs to be matched with a host of additional criteria, such as stable performance in uncontrolled environments (indoor or outdoor), device life expectancy in years, compatibility with aluminum housings and narrow flange requirements (no room for dual seals).

However, few EMI shielding gaskets, if any, are able to match this list of demands, which is why Parker Chomerics set about developing its latest generation of nickel-plated, aluminum-filled (Ni/Al) silicone elastomer EMI shielding gaskets. Here, nickel is plated on to nodule-shaped aluminum particles and dispersed into silicone, fluoro-silicone and EPDM polymers.

Trials Corroborate High Performance

The high performance of these advanced gaskets can be corroborated in trials. For instance, in tests on Cr3+ and Cr6+ Class 1A and Class 3 treated aluminum, Ni/Al gaskets show circa 50% less galvanic corrosion in comparison with Ag/Al alternatives at 500 or 1,000 hours in non-SO2 salt fog. What’s more, the gaskets demonstrate 20 dB higher shielding effectiveness (SE) in the range from 30 MHz to 18 GHz, as well as more stable SE in extended (1000 hour) temperature and humidity tests. SE is the ratio of the RF energy on one side of the shield to the RF energy on the other side of the shield expressed in decibels.

Extensive Benefits for End Users

Tests also show that Ni/Al gaskets retain strong mechanical performance after life testing. Not only will
the elastomer retain its environmental and physical EMI seal, but fluoro-silicone has excellent resistance to fluid swell. The benefits for end users are extensive. For instance, downtime and field service costs will be reduced considerably, around 50% in many cases, through fewer equipment inspections and reduced requirements to replace gaskets or repair flanges. In addition, Ni/Al gaskets support field equipment deployment in uncontrolled environments without the need for secondary enclosures. As a result, installation costs are lower, typically to the tune of 20 to 30%, while greater flexibility in location (portable, vehicular, airborne or fixed) is another advantage.

For non-marine or aerospace applications, Ni/Al gaskets make it possible to eliminate dual seals, metallic plated flanges, flange paint schemes and the use of Class 1A Cr to improve housing durability - all of which present considerable cost savings to the end user. The use of narrow gaskets with high SE also makes for a smaller overall package design. This is important as the trend is very much towards smaller and faster electronic devices.

In marine and aerospace environments, Ni/Al gaskets are intrinsically less active, providing longer life and more insurance against shielding decay and flange corrosion, regardless of design. Field repair costs will be reduced or eliminated, and total cost of ownership (TCO) minimized. In short, the industry now has an EMI shielding gasket solution to suit all of the market’s key application requirements.
In July, a 7-member biking team from the Parker-Prädifa plant in Bietigheim-Bissingen, Germany, embarked on its annual “Tour de Parker.” This time, the team set out to visit the Parker Sales Company in Corsico, Northern Italy. Besides “biking for the fun of it,” promoting team spirit, and visiting other Parker locations with the resulting benefit of gaining new professional insight, this year’s tour served another good purpose, as Parker-Prädifa donated 0.50 euros per participating team member and kilometer clocked. Rounded up, the donation amounted to 2,500 euros and subsequently benefited a new schooling program offered by the Vocational School Center (BSZ) in Bietigheim-Bissingen.

“It is by riding a bicycle that you learn the contours of a country best, since you have to sweat up the hills and coast down them...” In line with this quote by Ernest Hemingway, the Prädifa team set out to “sweat up” the hills on the way to Italy and to “coast down” them again, as the destination of the 2015 Prädifa bike tour was the Parker Sales Company in Corsico, not far from the Italian metropolis of Milan.

Annually “on Tour” since 2009

The Prädifa squad has been “going on tour” together since as far back as 2009. Destinations have included the Parker-Prädifa plants in Sadska in the
Czech Republic and in Boom, Belgium, Parker’s European headquarters in Etoy in the Lake Geneva region in Switzerland and – last year – the Bielefeld location in Germany that is part of the Parker Hannifin Corporation as well. These destinations are no coincidence as, in addition to physical fitness – which the company has been promoting as part of its active health management program billed as “Prädifa in Motion” for many years – the activities are intended to strengthen team spirit and professional exchange. And when a corporation with worldwide operations like Parker has locations in neighboring countries, visits to colleagues at such locations practically suggest themselves along the lines of “combining business with pleasure.”

Pedaling for a Good Cause

In addition to furthering this intrinsically useful purpose, this year’s tour was to serve another good cause. Per participating team member and kilometer clocked, the company donated 0.50 euros and subsequently rounded out the amount to 2,500 euros. The donation went to a new school-going program offered by the BSZ in Bietigheim-Bissingen. In a pre-qualification year for students without any knowledge of German, young adults between 16 and 18 years of age – most of them refugees – in addition to acquiring German language skills, are to be introduced to art, history and culture of their new living environment as part of a supporting program. The program is focused on activities that either require the young participants to apply their own skills and/or provides them with experiences they would not normally be able to gain on their own.

Important Integration Task

This is an important integration task for which donations like the one made by Parker-Prädifa can provide valuable assistance, according to Principal Stefan Ranzinger. The donation, for example, can help defray costs incurred for guided city tours, visits to various cultural and other public institutions, sports events, concerts and plays in the region, creative community projects, and much more.

In Line with Parker’s Values

Parker-Prädifa’s General Manager Thomas Ottawa shares this view: “When our biking team came up with the idea to combine their tour with a fund drive this year, we were immediately willing to make a financial contribution on company level. Social commitment, especially directly in the local region, has a long tradition at Parker. Integration, cultural diversity and professional education perfectly fit our company’s values as well. That’s why it didn’t take long for us to embrace the idea of this important concept.”

New Literature

X1 Anti-Extrusion Rings for the Aerospace Sector according to AS8791

Anti-extrusion rings (back-up rings) are used in combination with O-rings for static and dynamic applications to prevent gap extrusion. Thus they support the sealing element. They are manufactured from extrusion-resistant materials such as Polon® (PTFE) and have a rectangular cross-section.

www.parker.com/praedifa

Event Calendar

<table>
<thead>
<tr>
<th>Event</th>
<th>Location</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPI (Bio Process International)</td>
<td>Vienna, Austria</td>
<td>April 12 – 13, 2016</td>
</tr>
</tbody>
</table>

We look forward to your visit.
People

- **Jenny Parmentier** is new President of the Parker Engineered Materials Group and Corporate Vice President.

- **Gabriel Williams** has been appointed to the role of Market Development Manager Aerospace Europe.

- **Gary Foston** has assumed responsibility for the newly formed EMG Global Services Organization as Global Services Manager Oil & Gas.

Parker Engineered Materials Group under New Leadership

In August, **Jenny Parmentier** became President of the Parker Engineered Materials Group and Corporate Vice President. She succeeds Andy Ross, who was recently promoted to President of the Parker Fluid Connectors Group. Jenny Parmentier previously was General Manager at Hose Products and prior to that she was General Manager of the Sporlan Division. She joined Parker in 2008 from Trane, a business of Ingersoll Rand Corporation.

Jenny began her professional career in 1986 as a Material Planner/Expeditor at Lear Siegler Corporation. She joined Magna-Integram St. Louis Seating where she held positions of increasing responsibility including Production Scheduler, Production Control Supervisor, Materials Manager and Assistant General Manager. Jenny subsequently worked as a Plant Manager for Trane Residential Systems in Fort Smith, Arkansas, before joining Parker’s Instrumentation Group, Sporlan Division. Jenny holds a Bachelor’s degree in Management from Webster University.

Parker Engineered Materials Group

The Engineered Materials Group of the Parker Hannifin Corporation is the global leader in the field of designing, developing and manufacturing sealing systems, engineered components made from polymer materials, EMI shielding systems and heat dissipation materials.

With strong in-house compound and design expertise, testing and process technology plus state-of-the-art manufacturing facilities the Parker Engineered Materials Group offers a wide portfolio ranging from standard products through to tailored new and system developments. The latter frequently result from close development partnerships with customers in keeping with Parker’s motto: ENGINEERING YOUR SUCCESS.

Special importance is always attached to the sustainability of the products and solutions in the interest of benefiting the customer and the environment through optimum energy efficiency, reliability, durability and economy.

Fields of application range from mobile and stationary hydraulics, pneumatics, machinery and plant engineering, automotive engineering, the (bio-) chemical, pharmaceutical and medical (life sciences) sector, food processing, oil and gas, aerospace and semi-conductors through to electronics and telecommunications.

In addition to standard sealing elements and sealing systems, the product portfolio encompasses a wide range of special profiles and geometries as well as other engineered components, in- and outside sealing technology. Furthermore, the Engineered Materials Group offers a variety of services such as testing, kitting, product identification and much more.
On April 1, Gabriel Williams assumed the role of Market Development Manager Aerospace Europe.

Gabriel joined Parker Hannifin in February 2005 as Field Sales Engineer Automotive following Parker’s acquisition of Acadia Polymers. He served various automotive customers and in 2009 assumed a role as Global Account Manager for selected key accounts. Gabriel started his career as a development engineer with Acadia Polymers in 1995 where he was responsible for computer simulation (Finite Elements Analysis) and development projects. While enrolled in an integrated degree program in Mechanical Engineering at Virginia Polytechnic Institute, he gathered initial experience in sealing technology as a test engineer. In 1996, he assumed a role as Product and Application Engineer at the Woodridge, IL, plant that is now part of the Parker Engineered Seals Division. In 1999, he relocated to Germany, assuming a role as a Sales Engineer for the entire European market, focused on rubber-metal composite parts and transmission applications. In addition, he was in charge of an engineering partnership with a Czech company.

Gary Foston assumed responsibility for the newly formed EMG Global Services Organization as Global Services Manager Oil & Gas on June 1, 2015.

Gary has been heading up the Gulf Coast Seal Business Unit in Glasgow, Scotland, since November 2013 and will continue to serve as the functional leader for this unit. In addition, he now has responsibility for the EMG Service Centers in Houston and Edmonton and will take on the responsibility for the Houston Gulf Coast Seal Business Unit from July 2016 onwards. As Global Services Manager Gary will also be responsible for furthering Parker’s service model in Asia Pacific, Africa and Latin America in support of the global customer base. Gary began his Parker career in 2007 at the Filtration Group as a Division Engineering Manager. More recently, he served in the Asia Pacific Group where he was responsible for accelerating the localization of the Compressed Air and Gas Treatment Systems platform products to China, and developing project, engineering and product development capability across Asia. During his tenure with Parker, Gary has successfully led teams in designing and developing innovative new products and solutions to support global growth. Prior to joining Parker, he worked in the defense industry as a Senior Project Manager with BAE Systems. Gary is a Chartered Engineer and obtained a BSc (Hons) in Mechanical Engineering from the University of Northumbria.