DYNACOLL®: New low-emission polyesters for the automotive industry
Dynasylan®: Innovative silane adhesion promoters for low energy surfaces
POLYVEST® HT: Hydroxyl-terminated polybutadiene for adhesive and sealant applications
Dear Readers,

Being a global leading specialty chemical company in a dynamic environment requires creativity and a passion for innovation. When it comes to the Adhesives & Sealants Industry, Evonik is delivering both, creativity to develop new products which influence the properties of end-products, as well as the passion for engaging in customer "problems" and the ambition to solve them.

In the second edition of Evonik’s Adhesives magazine you will discover some of the outcomes of this strength in innovation: for instance, in flame retardant adhesives based on DYNACOLL® polyesters, a new generation of DEGALAN® binders for heat sealing applications or silane-based adhesion promoters for low energetic surfaces.

We believe that serving our customers from the Adhesives & Sealants Industry with solutions for energy and resource efficient end-products will pave the way for growth. At Evonik, we are ready to realize these growth opportunities with you.

Now I hope you enjoy reading this magazine and that it may give you the spark for your work in the world of Adhesives & Sealants.

Dr. Claus Rettig
Chairman of the Management Board of the Resource Efficiency Segment

Masterhead

Adhesives
The Adhesive Magazine of Evonik Industries

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Evonik’s world of Adhesives

Evonik offers a variety of solutions for the Adhesives & Sealants Industry. With more than 28 product brands and 330 different product grades, the adhesive experts from Evonik offer a broad product portfolio and deliver the right adhesive solutions to every industry. From the automotive sector, to the constructions industry, to the packaging and electronic markets, Evonik provides solutions for a wide variety of application areas. Discover Evonik’s world of polymers, crosslinkers, monomers and additives for the Adhesives & Sealants Industry and download our latest Adhesives-App for iOS, Android and Blackberry10.
As a market leader in organofunctional silanes (Dynasylan®) for adhesives and sealants, Evonik is always trying to offer the right innovative solution for an appropriate market requirement/need. Adhesives and sealants based on the SMP (Silane Modified Polymer) technology are a strongly growing product class due to its versatile and well-balanced properties, suitable for a wide variety of applications. Dynasylan® is playing a fundamental role as a high-performance additive in SMP to achieve continuously increasing product properties with regard to adhesion, mechanicals or water resistance. Traditional monomeric (aminofunctional) silanes typically give a versatile adhesion spectrum on various important substrates, e.g. in automotive and construction applications, although they show disadvantages such as low boiling points and high amounts of volatile organic compounds (VOC) during the cure.

Therefore, Evonik has developed two prototypes of a new generation of multifunctional silane oligomers: VPS SIVO 260 and VPS SIVO 280.

<table>
<thead>
<tr>
<th>New multifunctional silane oligomers</th>
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<tbody>
<tr>
<td>Flashpoint [°C]</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>VPS SIVO 260</td>
</tr>
<tr>
<td>VPS SIVO 280</td>
</tr>
</tbody>
</table>

Their special structures result in higher flash and boiling points. When using both new silane oligomers in formulations, some better compatibility between the adhesion promoter and polymers/resins can be achieved, coming along with a significantly reduced VOC. Thus, VPS SIVO 260 and VPS SIVO 280 might be a solution for a green future to face adhesion challenges specifically on critical plastic substrates. To illustrate the advantages of our new developments over traditional silanes, a broad lab study in moisture curable SMP systems has been carried out, formulation details are given in figure 2.

Next to improved handling (e.g. higher boiling point), environmental and labelling issues, excellent adhesion properties especially on difficult to glue low energy surfaces have been found in single lap shear tests. In detail, specimen bonded with the formulation...
Based on VPS SIVO 260 led to outstanding adhesion on polycarbonate (figure 3) while a STPU adhesive with VPS SIVO 280 showed excellent adhesion on PMMA (figure 4).

Moreover, improved adhesion with VPS SIVO 260 vs. standard aminosilane on PVC in a MS polymer formulation is shown in figure 5.

Next to the improved adhesion profile, the positive impact of the new multifunctional oligomers on the reactivity, mechanical properties etc. in SMP formulations define them as crucial additives for the growing high performance market.

In the following table (figure 6), the overall performance of the new silane oligomers in SMP formulations are listed as an overview with rating.

The new VPS SIVO grades have been developed predominantly for moisture curable SMP and silicones technologies, but we do see some additional markets in the adhesives and sealants industry (e.g. in 2K epoxy systems), using these high performance and environmentally friendly silanes.

In addition to the DYNACOLL® 7000 product group, Evonik also offers a portfolio of medium molecular weight polyesters based on renewable raw materials – DYNACOLL® Terra.

Adhesives formulators have a range of 9 different grades at their choice, which have been designed in a way which allows them to be combined in form of the established building-block system of amorphous, liquid and crystalline polyesters—to be combined to manufacture bio-based, sustainable reactive hotmelts. A determining factor in defining the desired physical properties of the polyester polyols in the DYNACOLL® Terra range was that the selected monomers were at least 30%, and ideally up to 100%, from renewable resources.

By definition, renewable resources are made from agricultural and forestry products that are systematically used by people as a source of energy or material for the production of chemical precursors, for example. In contrast to petrochemical substances, renewable resources are not finite, and therefore contribute to the sustainable provision of resources.

From an environmental perspective, the use of renewable resources helps to slow down the climate change because less greenhouse gases are released. A lower global warming potential (GWP) and thus a lower carbon footprint (CF) lead to a reduction in global warming.

The first carbon footprint assessments have now been carried out for two example grades of DYNACOLL® Terra, in which the carbon footprint for the life cycle of the products was determined—from the manufacture of the raw materials used right through to the finished polyester. Using renewable resources enables the carbon footprint to be reduced by up to approximately 60% compared to conventional petrochemical-based polyester polyols.

**DYNACOLL® Terra for sustainable adhesives**

Bio-based polyester polyols reduce carbon footprint

**Reduced carbon footprint**

- 58 %
- 56 %

**Cradle to gate evaluation**

<table>
<thead>
<tr>
<th>Raw materials and transport</th>
<th>Production</th>
<th>Product carbon footprint „cradle to gate“</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg CO₂ -Equiv./kg product</td>
<td>EP 481.01</td>
<td>EP 424.01, - 58 %</td>
</tr>
</tbody>
</table>

**Figure 1:** The „Cradle to gate“ carbon footprint is primarily influenced by raw materials

**Figure 2:** Results of the Carbon Footprint assessments for selected products

Data sources: Suppliers, GaBi database, CEFIC, own calculations

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Outlook

Low emissions thanks to DYNACOLL®

To meet the increasingly stringent requirements of the automotive industry, Evonik is developing new low-emission polyester polyols with low VOC and fogging values for reactive hot-melts.

Reactive polyurethane hot-melts based on DYNACOLL® polyester polyols are used in a variety of ways in the automotive industry for production of molded parts and in assembly bonding. After application of the adhesive at moderate temperatures, the parts set bond quickly, resulting in short cycle times that allow fast downstream processing of the bonded substrates. The subsequent cross-linking by moisture, such as atmospheric moisture, leads to bonds with extremely high final strength and temperature resistance. Moreover, the well-established modular system comprising amorphous, liquid, and crystalline DYNACOLL® 7000 polyesters allows targeted adjustment of the extensive requirements profile of the adhesive. The excellent adhesive properties allow the combination of different materials, including those that are difficult to bond.

For applications in automotive interiors, low-emission products are playing an increasingly important role. Sunlight, for example, rapidly raises the temperature inside the car, leading to emission of volatile components that could accumulate in the interior. This results in deterioration of breathing-air quality and a strong odor, and could be harmful to health. These volatile components may also condense on cold surfaces and affect visibility if deposited on windows, or change the tactile properties of covering materials. Depending on their volatility, emissions are characterized as VOC (volatile organic compound) values for highly to moderately volatile substances, or fogging values for low-volatility substances. A well-established measurement method is that of the VDA 278 standard. The limits are 100 µg/g for the VOC value and 250µg/g for the FOG value.

Whereas in the past the automotive industry specified the limits to be observed for an entire component, limits are now prescribed also for the individual constituents; the contribution of the emissions of the adhesives used thus also plays a role here. While cured PUR hot-melts based on particular combinations of amorphous and liquid polyester polyols can meet the required limits, conventional crystalline polyester polyols lead to significantly higher emission values and do not satisfy these requirements.

Evonik has now developed novel crystalline polyester polyols that meet the higher demanding requirements of the automotive industry and are distinguished by lower VOC and FOG values in the adhesive. The DYNACOLL® grades EP 432.01 and EP 432.02 have a melting point of 90°C and are very well suited for adjusting short open times for applications requiring short block-free times. To allow variation of the viscosity and cross-linking density, two versions with different hydroxyl numbers are available.

In RHM model formulations, for example, the new low-emission polyester DYNACOLL® EP 432.01 has been used in mixtures with the amorphous polyester DYNACOLL® 7360 and the liquid grade, 7280, and partially substituted with the conventional crystalline polyesters DYNACOLL® 7360 and 7810. The test results show that the very small proportion of volatile substances in DYNACOLL® EP 432.01 allows the addition of 20 percent of high-emission polyesters without exceeding VOC and FOG limits.

The new developments continue to offer the adhesive formulator high versatility in the DYNACOLL® modular system for high performance automotive applications. The products, for which a patent application has been filed, will be available on the market from now on.

<table>
<thead>
<tr>
<th>Characteristics of the new polyesters and their RHM data</th>
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<tbody>
<tr>
<td><strong>Polymer</strong></td>
</tr>
<tr>
<td>Hydroxyl number mgKOH/g</td>
</tr>
<tr>
<td>Acid number mgKOH/g</td>
</tr>
<tr>
<td>Melting point (DSC) °C</td>
</tr>
<tr>
<td>Viscosity at 130°C Pa.s</td>
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<tr>
<td>RHM* data</td>
</tr>
<tr>
<td>Viscosity at 130°C Pa.s</td>
</tr>
<tr>
<td>Open time sec</td>
</tr>
<tr>
<td>Setting time sec</td>
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</tbody>
</table>

VOC and FOG values of RHM model formulations

[Table with VOC and FOG values for different polyesters]

<table>
<thead>
<tr>
<th>Polymer</th>
<th>DYNACOLL® 7360</th>
<th>DYNACOLL® 7380</th>
</tr>
</thead>
<tbody>
<tr>
<td>pHv</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Setting time sec</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Viscosity at 130°C Pa.s</td>
<td>950</td>
<td>1500</td>
</tr>
</tbody>
</table>

VOC and FOG values of RHM model formulations

[Diagram with VOC and FOG values for different polyesters]
Evonik Industries has been appointed by Shell MDS (Malaysia) as the exclusive distribution partner for the South Asia, Middle East, North Africa regions and South America. Based on a successful distribution partnership in Europe since 1996, in which Evonik managed to continuously increase the sales of the synthetic GTL waxes sold under the brand “Shell GTL Sarawax”, the distribution territory for Evonik has been enlarged to cover South America in April 1st, 2015 and South Asia, the Middle East and North Africa since January 1st, 2015.

The recent decision by Shell to mandate Evonik as the new distribution partner for the growing South America region was based on their existing infrastructures as well as a dedicated sales force and customer service in the region. “The expansion of our distribution partnership with Shell reconfirms our understanding as an experienced solution provider for our customers in the Adhesives & Sealants Industry”, says Dr. Dietmar Wewers, Senior Vice President of Evonik’s Coating & Adhesive Resins Business Line. “Besides offering technical knowledge and a broad product portfolio for Adhesives & Sealants, Shell particularly values our customer intimacy as well as the access to the emerging markets.”

As a distribution partner of Shell GTL Sarawax as well as manufacturer of modified GTL waxes sold globally under the brand VESTOWAX®, Evonik has a long lasting technical experience and know-how and in-depth market knowledge. Besides the applications in hot melt adhesives, the products are incorporated in PVC lubricants as well as in the coatings and printing ink industry.

Evonik and Shell MDS (Malaysia) extend their sales partnership for synthetic Gas-to-Liquid (GTL) hardwaxes.

About VESTOWAX®
With its VESTOWAX® product range Evonik offers synthetic waxes produced by Fischer-Tropsch-Process. This process yields straight-chain products possessing low viscosity in the melt and having molecular weights of between 500 and 1,000 g/mol.

About Shell MDS (Malaysia)
Shell MDS (Malaysia) is the owner and operator of the Shell Middle Distillate Synthesis (SMDS) plant in Bintulu, Sarawak. The SMDS plant is the first of its kind in the world and is the culmination of over 30 years research into the utilisation of alternative raw materials for the production of fuels and specialty chemicals.

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An innovative synthetic Gas-to-Liquid (GTL) hard paraffin wax with low drop point

Shell GTL Sarawax SX 80

The partnership with Shell MDS (Malaysia) in the area of premium-grade synthetic GTL hard paraffin waxes is entering a new phase. In addition to the established Shell GTL Sarawax SX 105, with a drop point between 114 and 120°C, Evonik Industries AG is now marketing within its sales territory Shell GTL Sarawax SX80 – a new product distinguished by a unique property profile and produced using Shell’s cutting edge Gas-to-Liquid process.

Shell GTL Sarawax SX 80 is a synthetic GTL hard paraffin with significantly lower molecular weight and an extremely narrow molecular weight distribution. Along with a low drop point and additionally reduced melt viscosity, this combination results in a strongly pronounced crystallinity, thus allowing particularly precise control of industrial processes and further improvement in the accuracy with which specific product properties can be fine-tuned.

A particularly interesting potential field of application for Shell GTL Sarawax SX 80 is in hot melt adhesives, where it allows significantly reduced setting times and excellent substrate wetting for adhesives with low softening points.

Solvent-based mold release agents (such as for PU foam) are another suitable application. Here, Shell GTL Sarawax SX 80 combines easy and stable dispersibility with excellent release effect and enables particularly precise and effective process control.

The product is expected to become commercially available in the course of the second quarter of 2015.

<table>
<thead>
<tr>
<th>Provisional specification</th>
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<tbody>
<tr>
<td>Measurement method</td>
</tr>
<tr>
<td>Congealing point ASTM D 938</td>
</tr>
<tr>
<td>Penetration number ASTM D 1321</td>
</tr>
<tr>
<td>Viscosity at 100 °C Platte – Kegel (30.5 s-1)</td>
</tr>
</tbody>
</table>

POLYVEST® HT holds fast

Hydroxyl-terminated polybutadiene (HTPB) for use in adhesive and sealant applications

Contact:
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POLYVEST® HT is used mainly as a binder in adhesives and sealants. Due to its flexible and nonpolar polymer backbone, the low viscous liquid polybutadiene has outstanding chemical stability, high hydrophobicity, and, thanks to its low glass transition temperature of -80°C, excellent flexibility at low temperatures. Due to its hydroxyl functional groups the polymer can be chemically modified and used as a reactive component in adhesive and sealing compounds. These product features of POLYVEST® HT are advantageous for the application in polyurethane (PUR) based sealants.

HTTPB-based PUR systems have excellent properties such as low water vapor permeability and good electrical insulation characteristics; moreover, the mechanical properties can be varied over a wide range by adjusting the amount of filler and adding co-binders and additives. By varying the filler used, mechanical parameters such as hardness, tensile strength, and elongation at break can be systematically adjusted in liquid applied 2-component PUR compounds (see figure a) - c)). The additional use of functional silanes (such as an aminosilane) allows the mechanical properties to be further improved.

**Application areas of POLYVEST® HT**

**SEALANTS FOR INSULATED GLASS UNITS:**

Energy-efficient windows with multiple insulated glazing are generally used in the construction and modernization of buildings today. In these insulated glass units, a high insulating effect is ensured by the hermetically sealed gas space between the panes. DIN EN 1279 places high technical requirements on the necessary sealing compounds, and the use of POLYVEST® HT helps ensure that these requirements are met. Good adhesion to glass and aluminum, high flexibility even at low temperatures, and low permeability to gas and water vapor are essential for the sealing compound system to ensure a service lifetime of several decades.

**ELECTRICALLY INSULATING COMPOUNDS:**

POLYVEST® HT is also excellently suited as a binder for polyurethane sealing compounds in the area of electronic component insulation. Sensors and printed circuit boards are used in many devices in the home as well as in industry and the automotive sector. To ensure the reliability of these sensitive components, they must be protected against external influences. Two-component sealing compounds based on POLYVEST® HT are particularly suitable for this purpose because they can be applied in the liquid state, cure even at room temperature, and have outstanding electrical insulating properties. The hydrophobic and flexible sealing compounds reliably seal the current-carrying components, even when exposed to aggressive chemicals or thermal or other physical influences. In this application area as well, the properties of the HTTPB-based sealing compounds can be fine-tuned to requirements by targeted selection of fillers, co-binders, and additives.

**Benefits – POLYVEST® HT for PUR Applications**

- Excellent chemical resistance to acids and bases
- Very good hydrolytic stability
- Low temperature flexibility
- Low moisture permeability
- High elongation with good elastic recovery
- Compatible with high amounts of fillers

**Other application areas for POLYVEST® HT**

- Adhesive and sealing compounds in the automotive sector
- Electrical potting compounds
- Structural adhesives
- Sealing of expansion joints
- Polymeric plasticizers

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Evonik is adding a new product to its portfolio of liquid polybutadienes: POLYVEST® HT. This is a hydroxyl-terminated polybutadiene (HTTPB) for whose production a new plant with an annual capacity of several thousand metric tons has been started up at the Marl site.
Hot stuff

DEGALAN® heat seal binder from Evonik

Food packaging must be securely sealed and keep the product fresh. At the same time, it must be quick and easy to open. That means the lid of a yogurt cup must be sealed firmly enough to keep the yogurt well protected, but should still be easily removable from the cup. Lids are coated with heat seal lacquers and sealed onto the cup to keep the product fresh. At the same time, the fact that the new DEGALAN® VP P 34 replaces the two previously required priming or inclusion of adhesion promoters in the overall formulation can be an advantage in the production process for lacquer formulators as well as film/foil converters, which has interesting cost benefits.

DEGALAN® heat seal binders meet the requirements for adhesion on all conventional materials that are intended to come into contact with foods. Polyesters also are generally used as a primer for lid materials made of PET. DEGALAN® VP 4174 E by Evonik is an organic dispersion that allows for direct adhesion on both PET and AL lids. The product eliminates the need for the previously required PVC-based adhesion promoters, making DEGALAN®-based heat seal coatings highly environmentally friendly. The elimination of adhesion promoters also reduces the complexity of production processes for lacquer formulators as well as film/foil converters, which has interesting cost benefits.

DEGALAN® heat seal binders are characterized by their high heat seal strength on different substrates. The heat seal strength was tested and documented in the applications technology laboratory. For this purpose, two comparable formulations were created. In one formulation, the binder DEGALAN® VP P 34 was dissolved in ethyl acetate. In the comparison formulation, DEGALAN® P 24 was dissolved in methyl ethyl ketone (MEK), together with a PVC copolymer, in a ratio of 80 to 20.

There are numerous requirements for lacquers used in packaging: Yogurt cup lids made of aluminum or plastic must form a seal with a variety of cup materials, such as polystyrene (PS), polyethylene terephthalate (PET) or vinyl (PVC) with varying parameters such as sealing temperature or manufacturing technology. Of course, the material may not represent any health or environmental risks. Evonik offers four different groups of DEGALAN® binders. These include 100% solids, so-called bead polymers, organic solutions and dispersions, as well as aqueous dispersions. The great bandwidth of the portfolio allows for formulating a large variety of heat seal lacquers for sealing most commonly used cup/lid combinations.

Heat seal coatings formulated with a DEGALAN® organic dispersion can be universally used for sealing any cup. That means every DEGALAN® organic dispersion forms a seal with all conventional cup materials, such as polystyrene, PET, and polypropylene. Special PVC-based adhesion promoters are often needed in addition to the heat seal binder for coating aluminum lids. These are either applied in advance as an additional primer or directly included in the formulation of the heat seal lacquer. Polymers also are generally used as a primer for lid materials made of PET. DEGALAN® VP 4174 E by Evonik is an organic dispersion that allows for direct adhesion on both PET and AL lids. The product eliminates the need for the previously required PVC-based adhesion promoters, making DEGALAN®-based heat seal coatings highly environmentally friendly. The elimination of adhesion promoters also reduces the complexity of production processes for lacquer formulators as well as film/foil converters, which has interesting cost benefits.

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Even though bead polymers are used for sealing yogurt cups, their most frequent application is found in blister packs for pharmaceuticals. Until now, manufacturers had to use a combination of PVC-based adhesion promoters and DEGALAN® P 24 heat seal coatings for pharmaceutical blister packs. The new generation of heat seal-capable bead polymers developed by Evonik methacrylate experts therefore represents a major breakthrough.

The new product, DEGALAN® VP P 34, is dissolved, for example, in ethyl acetate and can then be applied directly to the aluminum foil. This eliminates the previously required priming or inclusion of PVC-based adhesion promoters in the formulation. DEGALAN® VP P 34 meets the requirements for adhesion on aluminum foil and for forming seals with blister packs in heat seal coating. At the same time, the fact that the new DEGALAN® VP P 34 replaces the two previously required binders reduces the complexity of the lacquer formulation. This reduction, in turn, has a positive effect on the use of the required solvents in the overall formulation. DEGALAN® VP P 34 is a head polymerize that can easily be dissolved in ethyl acetate, a common, relatively cost-effective, highly volatile solvent for heat seal formulations. As long as the other formulation components are suitable for this solvent, the overall formulation can therefore be reduced to the use of a single solvent.

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Both lacquer formulations were then applied to aluminum foil and dried at 180°C for 15 seconds. This resulted in a dried heat seal layer of approx. six µm. Subsequently, the coated aluminum foil was sealed on PVC and also on polystyrene, under laboratory conditions, using a strip seal device at a temperature of 180°C and a pressure of three bar, for 0.5 seconds. Measurement of the heat seal strength took place at an angle of 90°. Five repetitions with measurement strips having a width of 15 mm were carried out for the evaluation. The average value of these measurements shows that DEGALAN® VP P 34 on aluminum foil forms a seal with a heat strength of more than 7 N/15 mm at a temperature of 180°C. A comparable value is also achieved with the combination of DEGALAN® P24 and PVC copolymer in the formulation of 80 to 20.

Yogurt packaging, i.e. coated aluminum foil sealed on polystyrene, has a tendency to show higher strength values with DEGALAN® VP P 34 than in the combination of DEGALAN® P24 with PVC copolymer. In the formulation with DEGALAN® VP P 34, a value of 9 N/15 mm was determined at a sealing temperature of 180°C. A heat seal strength of more than 7 N/15 mm is already achieved at a temperature of 140°C.

The application technology studies illustrate that the new DEGALAN® VP P 34 is able to replace the previously used binder combinations of DEGALAN® P24 and PVC adhesion promoters in existing formulations. Due to the direct-adhesion properties of DEGALAN® VP P 34, no additional adhesion promoter is needed in the formulation, which leads to further simplification in formulating heat seal lacquers.

A heat seal strength of more than 7 N/15 mm was determined during the use phase. Flammability characteristics of PU dispersions and thereby reduce unpleasant odors as well as VOC content. The component used for the synthesis of VISIOMER® GLYFOMA comes from renewable raw materials.

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Adhesive Resins:

Innovation is in the air.

The Adhesive Resins Product Line at Evonik has ambitious goals. In the coming years, they intend to achieve a further increase in the strong growth of the past. To do so, the adhesives experts will be relying on their innovative strength and technical expertise, as well as their international alignment, in order to keep up with the trends and meet the challenges in the adhesives industry. Reliability and close cooperation with customers will also play a decisive role.

WHAT HAS BEEN HAPPENING AT ADHESIVE RESINS IN THE PAST TWO YEARS?

The Adhesives & Sealants Industry has experienced enormously dynamic developments in recent years. This is seen, among other things, in the growth rates, which are an average of 2-3% above those for gross domestic product. This is partly due to our innovative products and new areas of application. We, too, meaning the Adhesive Resins Product Line at Evonik, have also been working steadily on new ideas in recent years. This includes product innovations that we have developed to market maturity, such as POLYVEST® HT, a hydroxyl-terminated polybutadiene, VESTOPLAST® W 1750, a stable polyolefin dispersion, and DEGALAN® VP P 54, a bonding agent for heat seal coatings, which makes the use of PVC-based bonding agents superfluous. But for us innovation also means establishing new processes and services or opening up new areas of application. A very nice and successful example is our new patent-pending Easy Peel Package. It is a new packaging solution, which we have developed especially for our silane-modified reactive VESTOPLAST® 206. These various examples show clearly how much has happened here in recent months. And that makes me confident about the future.

WHAT TRENDS DO YOU SEE IN THE ADHESIVES INDUSTRY?

Scarc resources for certain raw materials, such as resins, remain a great challenge for the adhesives industry. Hydrocarbon resins are an elemental constituent of almost all adhesive formulations. A shortage in the market necessarily leads to limitations on our ability to deliver to our customers. We are reacting to this problem by developing formulations of polymers that require smaller proportions of resins and are thus better protected against crises. And naturally, topics such as adhesives for new substrates, for example lightweight construction materials in automobiles or in triple glazing – an adhesive that displays excellent adhesion on different substrates, for another instead of welding or riveting has already become a necessity in some areas of application, and this trend is sure to continue. There will be areas of application in which adhesives are not yet used today – and areas that we may not even have thought of yet. For me, such a universal adhesive with an easy-to-control characteristics profile would be the adhesive of the future.

THE TERM „ENVIRONMENTALLY FRIENDLY SYSTEMS“ IS BEING MENTIONED MORE AND MORE FREQUENTLY IN CONNECTION WITH ADHESIVES AND SEALANTS. HOW IS THE TREND OF SUSTAINABILITY AFFECTING THE ADHESIVES MARKET?

Green products remain a challenge for our industry. For one thing, the availability of sustainably obtained raw materials is still limited. For another, we cannot afford to lose sight of the economic aspects regarding research and development. Nevertheless – especially in Europe – the demand for environmentally friendly systems continues to grow. With DYNACOLL® Terra, a polyester prepolyol, which is based on renewable raw materials, we already marketed our first green adhesive polyester back in 2011. In addition to the environmentally friendly raw materials, another goal is resource efficiency, which means using products that contribute to a more efficient use of resources. Last year, we started up a plant for production of hydroxyl-terminated polybutadienes, our new POLYVEST® HT, which is used in adhesive and sealing compounds for lightweight construction in automobiles or in triple glazing.

IN CONCLUSION, A LOOK AT THE FUTURE: WHAT WOULD THE IDEAL ADHESIVE LOOK LIKE?

For me, it would be an adhesive with a broad range of adhesion – an adhesive that displays excellent adhesion on different substrates. Bonding construction elements or substrates to one another instead of welding or riveting has already become a necessity in some areas of application, and this trend is sure to continue. There will be areas of application in which adhesives are not yet used today – and areas that we may not even have thought of yet. For me, such a universal adhesive with an easy-to-control characteristics profile would be the adhesive of the future.

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„For us, innovation means developing new products and opening up new areas of application, but also making changes in our processes or services. In this context, cooperation with our customers around the world is of enormous importance.“

Dr. Gaetano Blanda, Vice President Adhesive Resins