

## Editorial Article

TPEs with adhesion to EPDM

Waldkraiburg, March 2018

Page 1 of 8

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### TPEs with adhesion to EPDM

**Innovative TPE technology for directly molding corner joints and ends to EPDM profiles**

**The automotive industry is the largest and fastest-growing market for thermoplastic elastomers. KRAIBURG TPE has identified an increasing demand for TPE compounds for high-quality exterior applications and has speeded up its application-specific development of efficient TPE solutions for this industry.**

The latest developments include TPE compounds with adhesion to ethylene propylene diene monomer rubber (EPDM). The materials from the THERMOLAST® K series have been specially developed for two-component parts used for automotive exterior applications and feature good adhesion to EPDM and excellent UV resistance. The new compounds are thus intended above all for automotive applications such as window trims and sealing profiles made of EPDM with molded corner joints and end elements made of TPE.

Particularly with large vehicle series, styrene-butadiene compounds (SBC) and crosslinked thermoplastic vulcanized (TPV) rubber have mainly been used for these applications in the past. Because the geometrical designs vary between the vehicle series, cost-effective processing of these materials is limited. KRAIBURG TPE's material solution, with adhesion to EPDM when processed by injection molding, offers new opportunities.

For the segment of sealing and window trim systems with EPDM, which are becoming more and more complex and sophisticated, KRAIBURG TPE has launched a new TPE series onto the market.

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## Editorial Article

**TPEs with adhesion to EPDM**

**Waldkraiburg, March 2018**

**Page 2 of 8**

The first compounds (TC7EAZ and TC7EFZ) in this series with adhesion to EPDM (AD/EPDM/UV<sup>1</sup>) combine good adhesion properties to EPDM with excellent long-term resistance to UV radiation and thermal effects with a hardness of 70 Shore A. Weathering tests have shown that the surface quality of KRAIBURG TPE compounds is superior to that of competing materials. In developing the individual compounds, the TPE specialist focused on adhesion (TC7EAZ) and processability as well as on low fogging values (TC7EFZ).

### **Good initial adhesion**

The application of the advanced EPDM adhesion series has been successfully tested in practice-oriented collaboration with LWB Steinl, a machine manufacturer, as well as in comprehensive laboratory tests and customer tests. To start with, the focus was on adhesion to EPDM. In addition to adhesion tests of EPDM/TPE specimens in accordance with the common VDI-2019 standard (at ambient temperature and after 1,500 hours at 90 °C), tests based on ISO 37 were also performed. Along with tensile stress and percent elongation, the absolute force required to destroy the specimen was determined.

In these adhesion tests, the new materials received good results with both foamed and compact EPDM workpieces. The initial adhesion plays a decisive role in allowing the finished parts to be easily removable from the mold with the shortest possible cycle times. In addition, the test series showed that adhesion mainly depends on the cleanness of the inserted EPDM profiles. To achieve optimal and reliably reproducible results, the profile parts should be cut within as short a time as possible before the TPE component is molded – the fresher the cutting, the better the adhesion.

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<sup>1</sup> AD/EPDM/UV: AD = adhesion, EPDM = ethylene propylene diene monomer rubber, UV = UV resistance.

## Editorial Article

**TPEs with adhesion to EPDM**

**Waldkraiburg, March 2018**

**Page 3 of 8**

The key requirements for exterior vehicle components also include lasting heat resistance and weathering resistance even with increased UV radiation. This was simulated by exposing material specimens to hot air in accelerated aging tests (1,500 hours at 90 °C and 120 °C) and to environmental conditions resembling those in Florida (heat and humidity) and the Kalahari Desert (heat and drought), for example, in weathering tests. In all of these weathering tests the AD/EPDM/UV series proved to have stable mechanical properties and featured significantly dry and non-adhesive surfaces.

### **Market-driven project partnership**

KRAIBURG TPE partnered with LWB Steinl GmbH, based in Altdorf near Landshut, Germany, to ensure stable processing of the new AD/EPDM/UV compounds through a thorough investigation of their processability.

LWB Steinl is one of world's leading global manufacturers of vertical transfer molding presses and horizontal injection molding machines for rubber and TPEs. Its range of products includes versions with a clamping force of 200 to 16,000 kN and energy-efficient injection units for injection volumes of 50 to 30,000 cm<sup>3</sup>. A vertical machine without tie bars was used for the tests performed in the manufacturer's processing laboratory (fig. 4). The test tool was delivered by PFAFF Werkzeug- und Formenbau from Röthenbach, Allgäu, Bavaria.

The economic processing of EPDM/TPE components with a vertical machine has the advantage that it saves space for feeding and downstream machinery. However, it also requires particularly carefully coordinated process controlling of the materials used. The special TPE formulation makes it possible to minimize the hold pressure in order to avoid deformation of the EPDM workpiece.

## Editorial Article

**TPEs with adhesion to EPDM**

**Waldkraiburg, March 2018**

**Page 4 of 8**

Although it might seem like a good idea to make the corner and end parts of the automotive sealing profiles out of EPDM as well, as with the window trims etc., that would result in longer cycle times due to the rubber's crosslinking and would require more complex machines and processing steps.

### **Shorter cycle times**

Increased process stability means lower scrap rates and is one of the most important factors for economically produced two-component parts. Reducing the typical cycle time for TPE injections into inserted EPDM workpieces was therefore an additional goal for the partners involved in the project.

KRAIBURG TPE's new EPDM adhesion compounds also feature economical processing. They are processed at relatively low temperatures of 200 °C to 220 °C. This results in lower cooling times, which, in combination with the minimized hold pressure time, accelerate the cycle and thus the overall production process as well. Along with these properties, the initial adhesion of the specially developed TPE compounds to EPDM materials ensures that the finished parts can be removed from the mold more easily and thus also reduces the cycle times.

Together with LWB Steinl we have managed to optimize the material and process technologies in such a way that they meet the requirements of different automotive window systems. The permanent adhesion and weathering resistance of the materials is not impaired.

In addition to comprehensive customer support, KRAIBURG TPE also offers custom-engineered color balancing, taking into account the gloss level, relative to the individual EPDM or the OEM's color specification.

## Editorial Article

TPEs with adhesion to EPDM

Waldkraiburg, March 2018

Page 5 of 8

### Conclusion

Supported by its market-specific development teams and its wide-ranging market knowledge, KRAIBURG TPE has created a new series of thermoplastic elastomers that accommodates the growing diversity of automotive window systems and enables two-component solutions with EPDM profiles to be produced economically.

The tests performed together with customers and also partners from the machine and tool industries to optimize the adhesion, weathering resistance and process stability of the EPDM adhesion technology underline the way in which KRAIBURG TPE is resolutely oriented toward its markets and customers. This uncompromising customer support is rounded out with application-oriented material formulations and color matching, as well as recommendations for processing and product consistency ensured batch by batch.

“The automotive industry is our largest and fastest-growing market. So we’ll be continuing to work intensively on new materials for the automotive industry in the future,” Franz Hinterecker from KRAIBURG TPE emphasizes.

KRAIBURG TPE is thus very well equipped to benefit – along with its customers – from the growing market opportunities for high-quality TPEs in this segment and to speed up the competitive implementation of sophisticated EPDM/TPE applications.

## Editorial Article

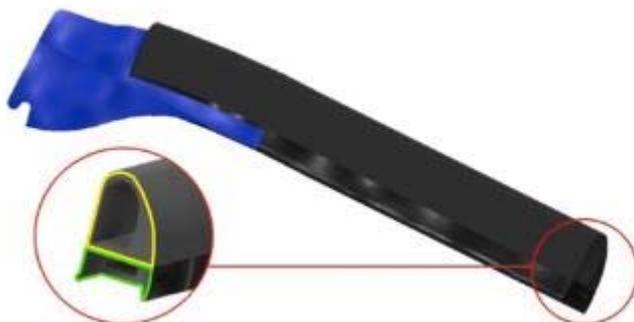
TPEs with adhesion to EPDM

Waldkraiburg, March 2018

Page 6 of 8

### About KRAIBURG TPE

KRAIBURG TPE ([www.kraiburg-tpe.com](http://www.kraiburg-tpe.com)) is a global manufacturer of thermoplastic elastomers. From its beginning in 2001 as subsidiary of the historical KRAIBURG Group founded in 1947, KRAIBURG TPE has pioneered in TPE compounds, today being the competence leader in this industry. With production sites in Germany, the US, and Malaysia the company offers a broad range of compounds for applications in the automotive, industrial, consumer, and for the strictly regulated medical sectors. The established THERMOLAST<sup>®</sup>, COPEC<sup>®</sup>, HIPEX<sup>®</sup>, and For Tec E<sup>®</sup> product lines are processed by injection molding or extrusion and provide numerous processing and product design advantages to manufacturers. KRAIBURG TPE features innovative capabilities as well as true global customer orientation, customized product solutions and reliable service. The company is certified to ISO 50001 at its headquarters in Germany as well as in Malaysia and holds ISO 9001 and ISO 14001 certifications at all global sites. In 2017, KRAIBURG TPE, with over 600 worldwide employees, generated sales of 178 million euros.



The new TPE technology for two-component parts with EPDM is intended above all for economical production of window trims and other sophisticated exterior automotive profiles.

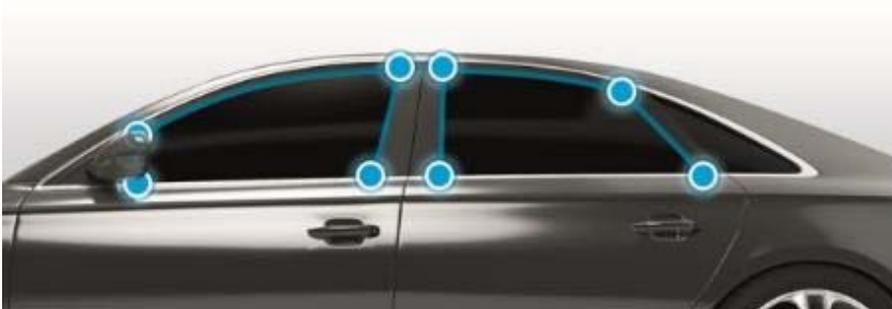
(Photo: © 2018 KRAIBURG TPE)

## Editorial Article

TPEs with adhesion to EPDM

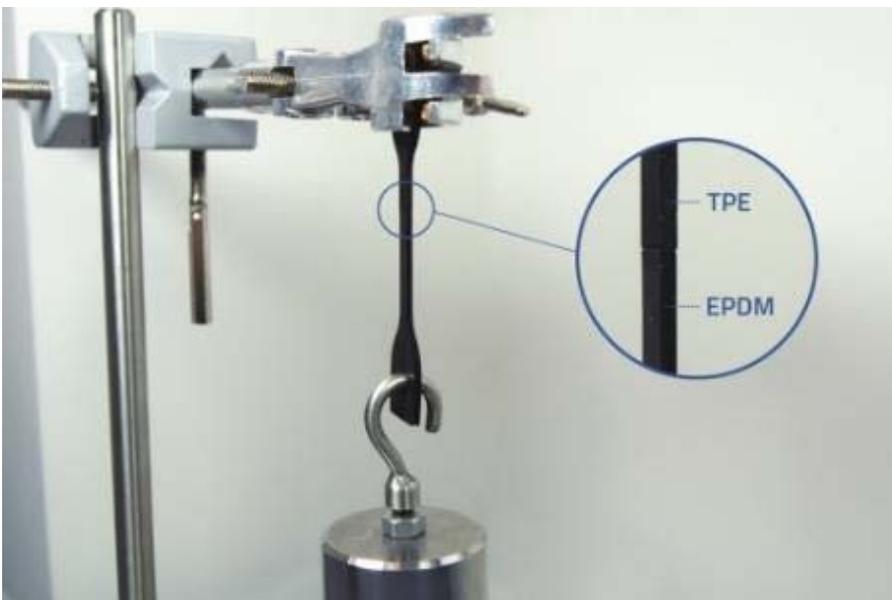
Waldkraiburg, March 2018

Page 7 of 8



Window trim and sealing profiles made of EPDM with molded THERMOLAST® K corner joints and end elements.

(Photo: © 2018 KRAIBURG TPE)



TPE compounds and EPDM materials show excellent adhesion even with a small contact surface. (Photo: © 2018 KRAIBURG TPE)

## Editorial Article

TPEs with adhesion to EPDM

Waldkraiburg, March 2018

Page 8 of 8



The process stability of the new TPE technology for two-component applications with EPDM was tested and optimized using a vertical machine by KRAIBURG TPE in collaboration with LWB Steinl.

(Photo © LWB Steinl)

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